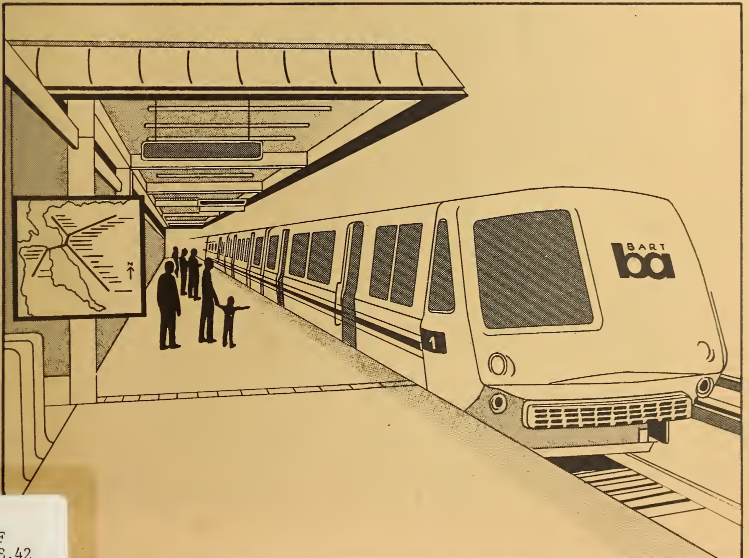
SAN FRANCISCO PUBLIC LIBRARY
3 1223 10225 9281

Metropolitan Transportation Commission

THE ECONOMIC AND FINANCIAL IMPACTS OF BART

DOCUMENTS DEPT.
[illegible] 9 1981
SAN FRANCISCO
PUBLIC LIBRARY



D
REF
388.42
B2813efi

FINAL REPORT

APRIL 1979

NOTICE

This document is disseminated under the sponsorship of the U.S. Department of Transportation and the U.S. Department of Housing and Urban Development in the interest of information exchange. The United States Government and the Metropolitan Transportation Commission assume no liability for its contents or use thereof.

Technical Report Documentation Page

1. Report No. DOT-P-30-79-04

2. Government Accession No.

3. Recipient's Catalog No.

4. Title and Subtitle The Economic and Financial Impacts of BART

5. Report Date April 1979

6. Performing Organization Code

7. Author(s) Richard Grefe, Angus N. McDonald

8. Performing Organization Report No. DOT-BIP-FR-8-7-77

9. Performing Organization Name and Address

McDonald & Grefe, Inc.,
303 Sacramento Street
San Francisco, California 94111

10. Work Unit No. (TRAIS) Task Order 7

11. Contract or Grant No. DOT-OS-30176

12. Sponsoring Agency Name and Address

U.S. Department of Transportation and
U.S. Department of Housing and Urban
Development, Washington, D.C.

13. Type of Report and Period Covered Final Report

14. Sponsoring Agency Code OST

15. Supplementary Notes The Metropolitan Commission is the prime contractor for the BART Impact Program. McDonald & Grefe, Inc. is the subcontractor responsible for the Economics and Finance Project.

16. Abstract

The 71-mile Bay Area Rapid Transit (BART) system is the first regional scale rapid transit system to open in the United States in over 50 years. This Final Report assesses the economic impacts of BART's $1.5 billion capital expenditures and $60 million annual operating expenditures on the Bay Area's regional economy.

This report documents the changes in regional sales, income and employment in the nine-county San Francisco Bay Area which were stimulated by BART's capital and operating expenditures. BART's impact on minority and female employment opportunity during construction and operations is evaluated. The impact of BART's construction expenditures on construction wage rates within the region is analyzed.

The tax incidence and tax burden of financing BART's capital construction and operations are identified. The impact of BART's bond issue on other public borrowing and the cost of public borrowing is evaluated.

The impact of transportation service on regional economic development is researched through shift/share analysis and an interviewing program.

17. Key Words Bay Area Rapid Transit (BART), BART Impact Program, Rail Rapid Transit, Public Mass Transit, Urban Transportation Planning, Transportation Program Evaluation, Economic Impact Analysis

18. Distribution Statement Document is available to the public through National Technical Information Service, Springfield, Virginia 22151

19. Security Classif. (of this report) Unclassified

20. Security Classif. (of this page) Unclassified

21. No. of Pages 117

22. Price

Form DOT F 1700.7 (8-72) Reproduction of form and completed page is authorized

3 1223 10225 9281

CONTRACT NO. DOT-OS-30176

THE ECONOMIC AND FINANCIAL IMPACTS OF BART

FINAL REPORT
REPORT NO. DOT-BIP-FR-8-7-77

PREPARED FOR

U.S. DEPARTMENT OF TRANSPORTATION

AND

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

WASHINGTON, D.C.

ACKNOWLEDGEMENTS

The analysis of the economic and fiscal impacts of BART was undertaken by a team headed by McDonald & Grefe, Inc. Angus N. McDonald was responsible for the technical approach and Richard Grefe was Project Manager during the entire project. Bartle Wells Associates, under the direction of Raymond O'Neil, was responsible for the evaluation of BART's impact on bond interest rates and on local government's financing decisions. Dukes, Dukes & Associates contributed to the analysis of economic and fiscal impacts on ethnic minorities and the University of California Cooperative Extension at Berkeley developed the two input-output models of the San Francisco Bay Area that were used in the project.

Many individuals and organizations contributed encouragement, technical assistance, and review of draft materials. Particularly grateful acknowledgement is due:

- the staff of the Metropolitan Transportation Commission, BART Impact Program, especially Franceen Lyons, Assistant Project Manager, Miriam Hawley, Marilyn Reynolds, and former MTC staff, Henry Bain, William Davidson and Wayne English;
- the County Assessors of Alameda, Contra Costa and San Francisco Counties who provided assessment data without which the fiscal assessment would have been impossible; and,
- the staff and facilities of the computer center at the Lawrence Berkeley Laboratory.

The contributions of these and many other individuals and organizations are gratefully acknowledged. Responsibility for the contents of the report rests with McDonald & Grefe, Inc.

Digitized by the Internet Archive
in 2015

https://archive.org/details/economicfinancia1979gref

SPONSOR'S NOTE

The BART Impact Program was a comprehensive, policy-oriented study and evaluation of the impacts of the San Francisco Bay Area's new rapid transit system (BART). The program began in 1972, and was completed in 1978. Financing for the Program was provided by the U.S. Department of Transportation, the U.S. Department of Housing and Urban Development, and the California Department of Transportation. Management of the Federally-funded portion of the Program was vested in the U.S. Department of Transportation (DOT). The Metropolitan Transportation Commission (MTC), a nine-county regional agency established by California law in 1970, administered the Program as prime contractor to DOT; the research was performed by competitively selected subcontractors to MTC.

The BART Impact Program studied the broadest feasible range of potential rapid transit impacts, including impacts on traffic flow, travel behavior, land use and urban development, the environment, the regional economy, social institutions and life styles, and public policy. The incidence of these impacts on population groups, local areas, and economic sectors was measured and analyzed.

The results of the BART Impact Program have been synthesized in BART in the Bay Area, the BART Impact Program Final Report (PFR). That report was prepared by MTC and presents MTC's conclusions from and interpretation of the Program's findings. In addition to the PFR, final reports for each of the individual projects in the Program were prepared by the consultants who conducted the research. The reports are listed at the end of this Note. The final reports are supported by numerous technical memoranda and working papers. The conclusions in those documents reflect the viewpoints of the respective consultants based on their research.

Readers of BART Impact Program reports should be aware of the circumstances and the setting in which BART was planned and built and the conditions under which the Program was conducted. An understanding of these factors is critical for interpreting the Program's findings and attempting to apply them to other areas.

First, it is important to note that the San Francisco Bay Area has a sound economy, a good system of highways and public transportation, and distinctive land use and development patterns shaped by the Bay and the hills around it. BART was approved and built during a period of vigorous growth in the Bay Area. The economy was expanding, suburban development was burgeoning, and major increments of highway capacity were being added. Also, the Bay Area already had extensive public transportation services. There were public carriers operating dense networks of local transit services on both sides of the Bay, and there was frequent transbay bus service from many parts of the East Bay to San Francisco. In 1972 before BART opened, approximately 10% of the total daily trips in the three BART counties were made on transit. All of these factors made it difficult in the study to isolate BART's effects from other influences that were affecting such things as travel behavior and urban development.

A second important point is that BART was planned and designed primarily to facilitate travel from outlying suburbs to downtown areas. Multiple stops are provided in the major central business districts, but in other respects BART is more like a commuter rail system (with long lines and widely-spaced stations) than a New York or Chicago-style subway system of interlocking crosstown lines and frequent stops. The BART system was intended to rival the automobile in comfort, speed, and convenience. Contemporary issues like energy conservation, air quality and service for the transportation disadvantaged were not widely recognized and publicized concerns during the period of BART's design.

The institutional setting in the Bay Area was a third important influence on BART's development. BART was developed as a separate institution without full coordination among existing transportation and regional development planning agencies. BART's planners had to make assumptions about policies and development, many of which turned out to be contrary to policies ultimately adopted by municipalities in the BART District.

A critical element in the study design of the BART Impact Program was the definition of the No-BART Alternative (NBA), the regional transportation facilities and travel patterns judged most likely to have evolved by 1976 if BART had not been built. The definition of an NBA was essential since the Program defined an impact as the difference between what actually occurred with BART and what would have resulted without BART. One cannot be certain about what the region would have been like had BART not been built. But based on an analysis of the political and economic decision history of the Bay Area and the professional judgment of those involved in the Program, it was determined that no significant changes to the area's freeway and bridge systems as they actually were in 1976 would have occurred without BART. It was concluded further that the public transit network and services would have been very similar to what they were just before the start of BART transbay service. One consequence of this assumption is that the NBA provides lower levels of service and less capacity than the with-BART system, and attracts fewer riders. The NBA does not extrapolate beyond 1976 and does not consider how much additional capacity in the transportation system might eventually have been required because of increasing travel demand and congestion.

An important factor affecting the findings was that BART was not operating at its full service level during the period of study by the BART Impact Program. The frequency of trains, their operating speeds, the reliability of their operations, and the capacities provided in peak periods of travel by BART were considerably lower than those originally planned. Trains were running on 12-minute headways instead of the 4.5 minutes originally planned for each of the four lines (90 seconds where three lines converged). BART did not initiate service on all lines simultaneously in 1972 but instead phased in service. The most critical link, the Transbay Tube, was not opened until late 1974. Night service did not start until the end of 1975, and Saturday service started in 1977. Direct Richmond to Daly City service still is not operating, and it now appears that "full service levels," when they are attained, will not achieve the headways and average speeds announced in the original plans.

The final point is that BART had only been operating for a relatively short period of time when its impacts were studied. The impact assessment largely depends on data collected in the first four years of BART's operations. It is likely that some of its impacts, particularly those relating to urban development, will require more time to mature.

Final Reports

These documents are available to the public through the National Technical Information Service, Springfield, VA 22151:

Metropolitan Transportation Commission, "BART in the Bay Area. The Final Report of the BART Impact Program," MTC, 1979.

Gruen Associates, Inc. and DeLeuw, Cather & Company, "Environmental Impacts of BART," MTC, 1979.

Peat, Marwick, Mitchell & Co., "BART's First Five Years: Transportation and Travel Impacts," MTC, 1979.

Jefferson Associates, Inc., "Impacts of BART on Bay Area Institutions and Life Styles," MTC, 1979.

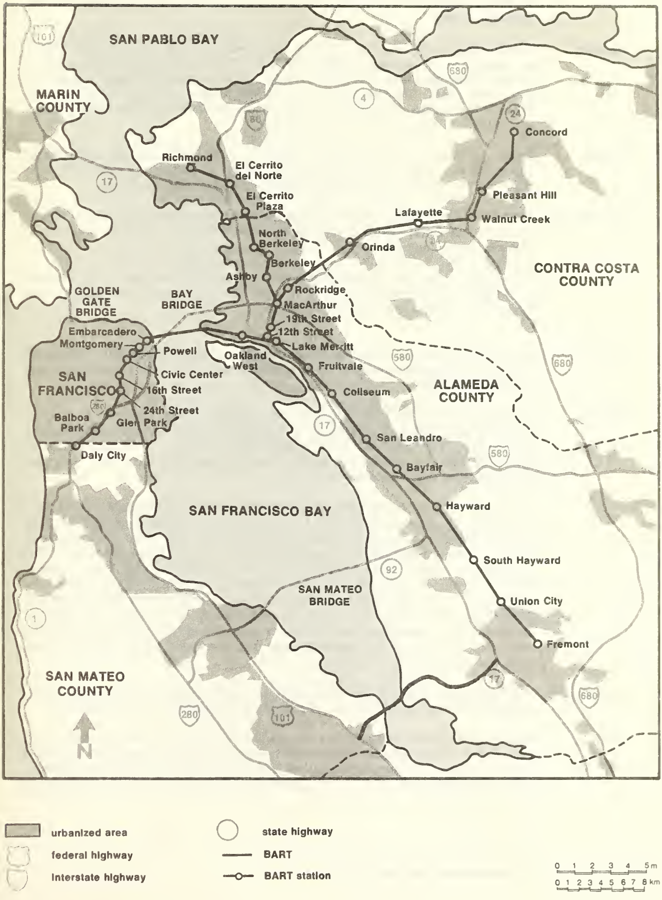
McDonald & Grefe, Inc., "The Economic and Financial Impacts of BART," MTC, 1979.

John Blayney Associates/David M. Dornbusch & Co., Inc., "Land Use and Urban Development Impacts of BART," MTC, 1979.

Booz, Allen & Hamilton Inc., "The Impact of BART on Public Policy," MTC, 1979.

Urban Dynamics Associates, "Implications of BART's Impacts for the Transportation Disadvantaged," MTC, 1978.

Alan M. Voorhees & Associates, Inc., "Federal Policy Implications of BART," DOT, 1979.


SAN PABLO BAY
MARIN COUNTY
101
680
4
80
24
17
Concord
Richmond
El Cerrito del Norte
El Cerrito Plaza
Pleasant Hill
Lafayette
Walnut Creek
North Berkeley
Orinda
24
Berkeley
Ashby
CONTRA COSTA COUNTY
GOLDEN GATE BRIDGE
BAY BRIDGE
Rockridge
MacArthur
19th Street
12th Street
Embarcadero
Montgomery
Powell
Lake Merritt
Oakland West
580
680
Fruitvale
Civic Center
SAN FRANCISCO
16th Street
Coliseum
ALAMEDA COUNTY
280
24th Street
Balboa Park
Glen Park
17
San Leandro
Daly City
580
Bayfair
Hayward
SAN FRANCISCO BAY
South Hayward
92
SAN MATEO BRIDGE
Union City
1
Fremont
SAN MATEO COUNTY
17
680
280
101
N
urbanized area
federal highway
interstate highway
state highway
BART
BART station
0 1 2 3 4 5 m
0 1 2 3 4 5 6 7 8 km

BART:	The Bay Area Rapid Transit System
Length:	The 71-mile system includes 20 miles of subway, 24 miles on elevated structures and 27 miles at ground level. The subway sections are in San Francisco, Berkeley, downtown Oakland, the Berkeley Hills Tunnel and the Transbay Tube.
Stations:	The 34 stations include 13 elevated, 14 subway and 7 at ground level. They are spaced at an average distance of 2.1 miles: stations in the downtowns are less than one-half mile apart, while those in suburban areas are two to four miles apart. Parking lots at 23 stations have a total of 20,200 spaces. There is a fee (25 cents) at only one of the parking lots. BART and local agencies provide bus service to all stations.
Trains:	Trains are from 3 to 10 cars long. Each car is 70 feet long and has 72 seats. Top speed in normal operations is 70 mph with an average speed of 38 mph including station stops. All trains stop at all stations on the route.
Automation:	Trains are automatically controlled by the central computer at BART headquarters. A train operator on board each train can override automatic controls in an emergency.
	Magnetically encoded tickets with values up to $20 are issued by vending machines. Automated fare gates at each station compute the appropriate fare and deduct it from the ticket value.
Fares:	Fares range from 25 cents to $1.45, depending upon trip length. Discount fares are available to the physically handicapped, children 12 and under, and persons 65 and over.
Service:	BART serves the counties of Alameda, Contra Costa and San Francisco, which have a combined population of 2.4 million. The system was opened in five stages, from September 1972 to September 1974. The last section to open was the Transbay Tube linking Oakland and the East Bay with San Francisco and the West Bay.
	Routes are identified by the terminal stations: Daly City in the West Bay, Richmond, Concord and Fremont in the East Bay. Trains operate from 6:00 a.m. to midnight on weekdays, every 12 minutes during the daytime on three routes: Concord-Daly City, Fremont-Daly City, Richmond-Fremont. This results in 6-minute train frequencies in San Francisco, downtown Oakland and the Fremont line where routes converge. In the evening, trains are dispatched every 20 minutes on only the Richmond-Fremont and Concord-Daly City routes. Service is provided on Saturdays from 9 a.m. to midnight at 15-minute intervals. Future service will include a Richmond-Daly City route and Sunday service.* Trains will operate every six minutes on all routes during the peak periods of travel.
Patronage:	Approximately 146,000 one-way trips are made each day. Approximately 200,000 daily one-way trips are anticipated under full service conditions.
Cost:	BART construction and equipment cost $1.6 billion, financed primarily from local funds: $942 million from bonds being repaid by the property and sales taxes in three counties, $176 million from toll revenues of transbay bridges, $315 million from federal grants and $186 million from interest earnings and other sources.

March 1978

***Sunday service began in July, 1978**

TABLE OF CONTENTS

SUMMARY FINDINGS i

I. INTRODUCTION 1

II. RESEARCH APPROACH 3

- A. Theoretical Framework 3
  - 1. Expenditure Impacts 3
  - 2. Construction Wage Rate 4
  - 3. Financial Impact and Tax Burden 4
  - 4. Employment Opportunity 4
  - 5. Impact of the Bond Issue 5
  - 6. Impact of Transportation Service on Business 5
- B. Definition of Impact 5
- C. Definition of the Region 10
  - 1. Expenditure Impacts 10
  - 2. Economic Development Impacts 10
  - 3. The Financial Impacts 11
  - 4. Labor Market Analysis 11
- D. Limitations on Transferability of Findings. . 11

III. THE ECONOMIC AND FINANCIAL IMPACTS OF BART'S CAPITAL EXPENDITURES 13

- A. The Direct and Indirect Impacts of Construction Expenditures on Regional Sales, Employment and Income 13
  - 1. The Cost of Building BART (Direct Expenditures) 14
  - 2. Impacts on Regional Sales and Income . . 16
  - 3. Regional Employment Effects 17
  - 4. The Impact on Minority Employment Opportunity 19
  - 5. The Impact on Construction Wage Rates. . 22
  - 6. Regional Income Effects 24

B. The Tax Burden and Financial Impact of Constructing BART 24
  1. The Impact of BART Capital Financing . . 25
  2. The Burden of BART Capital Financing . . 27
    a. Property Tax 27
      1) Burden Borne by Households . . 28
      2) Geographic Distribution of the Tax Burden 30
    b. Sales and Use Tax 30
    c. Bridge Tolls 32
    d. Highway User Taxes 32
    e. General Revenue Funds 33
    f. Total Burden 33
  3. Equity Considerations of BART's Capital Financing 34
C. The Impact of BART's Bond Issue on Regional Public Financing 36
  1. The Impact of BART's Bond Issue on the Cost of Public Borrowing 38
    a. Statistical Data 38
    b. Key Informant Interview Program . . 39
    c. Findings 40
  2. The Impact of BART's Bond Issue on the Financing of Other Public Projects . 40
    a. Statistical Analysis 41
    b. Interview Program 42
    c. The BART Impact on Financing Options 43
  3. The Implications for Public Transit Financing 44
IV. THE ECONOMIC AND FINANCIAL IMPACTS OF OPERATING BART 45
A. The Impacts of BART Operations on Regional Sales, Income and Employment 45
  1. The Cost of Operating Transit (The Direct Expenditure) 45

    2. Regional Output Effects 46
    3. Regional Employment Effects 50
    4. Regional Income Effects 52
    5. The Impact of BART Permanent Employment on Employment Opportunity 52

        a. Employment Opportunity for Women on the Work Force 57
        b. Employment Opportunity by Race or Ethnicity 57

  B. The Tax Burden and Impact of Financing BART Operations 58

    1. The Impact of Financing BART Operations 58
    2. The Impact of BART Operations 60

        a. Property Tax 60
        b. Sales and Use Tax 62
        c. Fares 62
        d. Total Burden of Financing BART Operations 64

    3. Final Incidence of BART Operating Costs for Typical Households 64

V. BART'S IMPACT ON ACCESSIBILITY TO EMPLOYMENT AND ITS USE FOR BUSINESS

  A. Employment Accessibility 67

  B. Racial Characteristics of BART Riders 70

  C. Business Use of BART 72

VI. EFFECT OF TRANSIT SERVICE ON THE COMPETITIVE ADVANTAGE AND EFFICIENCY OF BAY AREA BUSINESS OPPORTUNITIES 73

  A. Shifts in Bay Area Employment Since 1965 . . 73

  B. Investigation of BART's Impact on Competitive Shifts 76

    1. Interview Program 76
    2. Case Study Findings on Transportation Service Impacts 78

VII. CONCLUSIONS AND IMPLICATIONS 82

A. Rapid Transit in the Bay Area has had Little Measurable Impact on Regional Economic Development 82

B. Capital Expenditures for a Rapid Transit System Will Have a Positive Short-Term Impact on the Regional Economy 83

C. Operation of Rapid Transit in the Bay Area Stimulates the Economy More than Bus Transit, Because BART Costs More to Operate 84

D. BART's Expenditures on Construction Resulted in Short-Term, if not Long-Term, Increases in Employment Opportunity for Minorities in the Construction Trades 85

E. A New Transit Agency is Capable of Improving the Employment Opportunities for Women and Minorities 86

F. Households Will Pay the Majority of BART's Local Construction Costs, with a Heavier Relative Burden on Lower-Income Households. . 86

G. The Magnitude of BART's Bond Issue Had No Impact on the Cost of Other Local Borrowing . 87

H. Households Will Pay the Majority of the Operating Deficit with Lower-Income Households Bearing a Heavier Relative Burden . . . 87

I. Locally Financed Costs of Providing Bus Service with BART are More Than They Would Be Without BART 88

J. The Implications of the Economic Development Impacts for Federal Transportation and Urban Development Policies 88

K. The Implications of the Expenditure Impacts for Federal Transportation and Urban Development Policies 89

L. The Implications of Employment Impacts for Federal Equal Opportunity and Affirmative Action Programs 90

TABLE OF CONTENTS (continued)

M. Transferability of the Techniques of the Economics and Finance Project 90
    1. Comparison Between Alternatives 91
    2. Estimating Impacts of Construction and Operation 91
    3. Estimating Impacts on Business Efficiency and Economic Growth 92
    4. Estimating Impacts on Employment Opportunity 93
    5. Estimating Fiscal Burden 94
    6. Estimating the Impact on Local Government Financing Decisions 94

REFERENCES 95

STAFF FOR THE CONSULTANTS 97

LIST OF TABLES

II-1 Illustration of the Impact Framework 7

II-2 A Summary of the BART and NBA Scenarios . . . 8

III-1 Regional Sales and Income Effects from BART Construction, 1964-1976 15

III-2 Regional Employment Effects from BART's Construction, 1964-1976 18

III-3 BART On-Site Construction Work Force by Skill Level and Ethnic Characteristics, Summary 1967-1971 21

III-4 The Financing Plan for BART Construction . . 26

III-5 Assumptions on the Shifting of Burden for Taxation of Property and Improvements 29

III-6 BART Property Tax Incidence for Capital Debt Retirement, District Total 1964-1999 29

III-7 Property Tax Burden by County, BART Capital Costs, 1964-1999 30

III-8 Assumptions on Final Incidence of Tax Burden for Sales and Use Tax 31

III-9 Final Incidence of BART Capital Costs Funded by Sales Tax, by County and District, 1970-1976 32

III-10 Total Burden of BART's Capital Costs, The Incidence of Property and Sales Taxes, 1964-1999 33

III-11 Annual Tax Burden of Typical Households for BART Capital Expenditures, 1976 35

III-12 Typical Household Tax Incidence by Per Capita Income Category for BART Capital Expenses . . 37

IV-1 BART Impact on Operating Expenditures 47

IV-2 Regional Output Effects from BART Operating Expenditures, 1976 48

IV-3 Sales and Income Multipliers for Operating Expenditures 49

IV-4 Employment Characteristics of Transit Agencies, 1976 50

LIST OF TABLES (continued)

IV-5 BART Impact on Employment from Transit Operating Expenditures, Fiscal Year 1976 . . . 51

IV-6 Impact of BART on Minority Employment by Public Transit in the Bay Area by Salary Level 53

IV-7 Impact of BART on Female Employment in Public Transit in the Bay Area by Salary Level 54

IV-8 BART Employment Impact on Minority Opportunity by Job Category, 1976 55

IV-9 BART Employment Impact on Female Employment Opportunity by Job Category 56

IV-10 BART Impact on the Operating Costs and Financing of Regional Transit, Fiscal Year 1975/76 59

IV-11 BART Property Tax Impact for Operating Requirements, Fiscal Year 1976 61

IV-12 Final Incidence of Sales Tax by County and District, BART FY 1976 Operating Budget . . . 62

IV-13 BART Fare Payments Classified by Income of Rider 63

IV-14 Final Incidence of Operating Subsidies, BART Impact in FY 1976 64

IV-15 Tax Burdens of Typical Households for BART Operating Expense Impact, 1975-76 66

V-1 Average Access Time from All Zones in the Three-County Region to Employment Centers . . 68

V-2 Racial Profile of BART Riders Making Trips During AM Peak Period 70

V-3 Racial Profile of the Three BART Counties . . 70

V-4 Percentages of Racial Groups Riding BART Having Destinations in High Employment Centers 71

VI-1 Shifts in Employment in the BART Counties, 1965-1973 75

SUMMARY FINDINGS

The Economics and Finance Project of the BART Impact Program was designed to contribute to understanding what impacts the construction and operation of rapid transit in the Bay Area have had on the region's economy and public finance.

The project has sought to measure the impact of expenditures for BART's construction and operation on sales, income and employment for the nine-county Bay Area region. Financing these expenditures has impacts also, on the tax burden borne by residents of the three BART counties. The tax-incidence analysis investigates who will have paid for BART by the time the debt is retired, and who pays for current operations. Moreover, given the magnitude of the cost, financing BART's construction could have had an impact on the costs of borrowing by other public agencies and the manner in which other capital improvements are financed; these questions were investigated too.

Also within the project scope was examination of certain socio-economic impacts, such as the effect of BART service on employment opportunities for minorities and the unemployed, the impact of BART's public expenditures on construction employment for minorities, and the permanent employment opportunities for females and minorities associated with a new rapid transit system.

A final issue that was addressed, presenting the most difficult impact to evaluate, was the influence of rapid transit – as an element of the regional infrastructure – on the economic development of a region. Rapid transit improvements frequently are justified on the basis of their potential impact on a region's economic well-being. Better access to a broader labor force and more efficient business communications are cited as transit's contribution to the competitive advantage for industry in a region. Economic growth might even be stimulated if industry chose to locate within a region because that region's image might be enhanced by a high-technology rapid transit system. This project aimed to assess any economic development impacts accruing to the nine-county region which could be traced to BART. The question of whether BART induced changes in the patterns of land use and development within the Bay Area is not the subject of this project. That question is being considered as part of the Land Use and Urban Development Project of the BART Impact Program.

The precise definition of an economic or financial impact of BART is crucial to this project. An impact is defined as the difference between two courses of events, as measured against the same criterion at the same point in time. Evaluation of a BART impact is, then, an assessment of BART as measured against an alternative transit system which might have been in place in 1976. The BART Impact Program has established a hypothetical No-BART Alternative (NBA) as the transportation system judged most likely to have evolved in the central Bay Area by 1976 had the decision to build BART not been made in 1962. The NBA serves to isolate net effects of BART from those changes which occurred as a result of factors other than BART.

The NBA includes all freeways and principal local streets which existed in 1976 but assumes no additional highway facilities. NBA also assumes relatively minor changes in operations of the major transit services in the central Bay Area (from the actual 1971 pre-BART base to the hypothetical 1976 NBA) in that it retains the 1973 or peak-year transit service of Greyhound commuter buses from central Contra Costa County to the Oakland and San Francisco CBD's, and AC Transit's transbay commuter service between Alameda and Contra Costa Counties to San Francisco's CBD. Small improvements in frequencies in San Francisco's MUNI's routes in the Mission corridor, but no new routes, are assumed. The only capital cost associated with NBA is the potential addition of fifteen buses for peak-hour service in San Francisco.

THE IMPACT OF RAPID TRANSIT SERVICE ON ECONOMIC DEVELOPMENT

The hypothesis that rapid transit in the Bay Area had an impact on regional economic development was not supported.

The objectives of regional economic development are to improve the economy of a region by more fully utilizing the region's resources and by capturing an increasing share of national growth. There is no evidence that BART contributed to either of these objectives.

Although analysis of employment data indicates that five industry groups within the San Francisco Bay Area — government, central office activity, services, financing and manufacturing — have grown faster than can be explained by national or industry trends since 1962 (when BART's implementation became predictable), extensive interviews within these industries failed to disclose any BART influence on such growth.

It has been hypothesized that rapid transit could affect economic development by providing industry locating in a region with a competitive advantage it would not experience otherwise. One way of achieving that competitive advantage is to provide employment centers with easier access to a larger work force by reducing the travel time between employment centers and residential areas in a region.

Preliminary accessibility comparisons between the alternatives might appear to indicate this has occurred. BART has improved access time for the total population of the BART counties to the region's employment centers by an average 19 percent (eight minutes). The improved accessibility is greater for higher-income white households, but this reflects BART's original transportation objective, to relieve congestion on the suburban-to-downtown transportation corridors — commute routes serving primarily higher-income white households.

The unemployed appear also to experience decreased travel time to employment centers with BART. This reduction does not necessarily imply greater employment opportunity for the unemployed, since the average access time is reduced by only five minutes. Nonetheless, BART may have increased Bay Area employment accessibility by making public transit feasible for the commute between distant East Bay communities and San Francisco and Oakland employment centers.

The region also could appear more attractive to industry if business efficiency within the region were improved as a result of rapid transit service. For efficiencies to occur, rapid transit would need to be useful for interpersonal or interoffice communication, to facilitate messages or deliveries, or to facilitate meetings among persons in the business community. But only 10.2 percent of off-peak trips currently are used for business purposes. Extensive interviewing failed to confirm that business use of BART has increased business efficiency. In some instances, it was indicated that BART's unreliability, in fact, made for reduction in operating efficiency for some Bay Area businesses.

The BART experience would indicate that, at least in the Bay Area, introducing rapid transit has not been a *sufficient* condition for increased economic development and growth.

THE IMPACTS OF CONSTRUCTING BART

Capital expenditures on a rapid transit system in the Bay Area had a positive short-term impact on the region's economy.

The cost of building and equipping BART was more than $1.5 billion, of which $1.2 billion initially was spent in the nine-county Bay Area. Including all secondary impacts of this construction activity, the total increase in goods and services purchased within the region was $3.1 billion between 1964 and 1976.

BART's construction budget was responsible for 31,000 person-years of direct employment during the 12-year construction period. Including indirect employment generated by this construction activity, the total employment impact was 75,000 person-years.

Construction expenditures and all secondary economic impacts of these expenditures increased household income in the region by $927 million.

The expenditure impacts are significant, despite their direct relation and little residual effect on the economy. To the extent that these impacts are a function of spending money, they are not related solely to a transit investment. Although large, these expenditure impacts did not alter significantly the regional economy. They represented less than one-half of one percent of the gross regional product, total regional employment, or personal household income in the region in any given year.

BART's expenditures on construction increased employment opportunity for minorities in the construction trades, but did not necessarily enhance minority job skills.

One of BART's economic opportunities was to use expenditures for construction as leverage in improving the employment potential for minorities within the region.

By establishing equal employment standards, the percentage of minorities in BART's construction labor force reached 36 percent, significantly higher than the 22 percent participation of minority workers in the regional construction work force. Despite this impact, the largest share of minority employment occurred within the laborer category, which involves day labor with little potential for skill enhancement.

THE IMPACTS OF OPERATING BART

Operating rapid transit in the Bay Area stimulates more economic activity than bus transit because BART costs more to operate.

BART costs $47 million more per year to operate than the bus alternative to which it was compared in the BART Impact Program. BART's expenditures on transit will have a total impact on the regional economy, including all the secondary sales and income generated, of nearly $149 million per year, including an increase of nearly $52 million per year in personal income. The employment equivalent of this total impact is over 3,000 permanent jobs within the region.

THE IMPACTS OF FINANCING BART

Households will pay the major share of BART's local construction costs, with a heavier burden on lower-income households.

Total local costs of BART's basic system, over the repayment period of the general obligation bonds, will total $1.7 billion, including retirement of the debt and repayment of the interest. Sixty-five percent of this local cost will be borne by households, either as consumers of housing or as consumers of retail goods. The percentage of the tax burden borne by business which cannot be shifted to the consumer will total 24 percent of the total local cost; nearly 11 percent of the financing cost will be paid by nonresidents of the region, or through homeowner, elderly and business property tax exemptions which are refunded from the State General Fund.

BART's financing, which (eventually) relied primarily upon the property tax and sales tax, imposed a greater burden as a percentage of income, on households in the district with lower incomes than those with higher incomes. In 1976, the annual costs of retiring the capital debt imposed a burden equivalent to 0.72 percent of the income of a retired individual living on $4,500 per year. An affluent family of four, earning over $45,000 per year, would pay a third of that percentage, only 0.24 percent of its income.

The magnitude of BART's bond issue had no impact on the cost of other local borrowing.

Increased bond indebtedness frequently is associated with increasing interest cost. Nonetheless, this study was unable to identify increases in the cost of public borrowing which could be related to the magnitude of BART's bond issue. Nor was there sufficient evidence to indicate that local agencies or jurisdictions sought to finance capital improvements with nonvoted bond issues, or to defer projects altogether, for fear of voter rejection in the shadow of BART's impact on the regional bond indebtedness.

The stability of interest rates for other public borrowing within the BART District, despite the size of BART's bond issue, may have reflected a favorable perception of BART as a contribution to the infrastructure.

Households pay the largest share of BART's operating costs; lower-income households bear the heaviest burden.

The difference in operating costs between rapid transit (BART) and bus transit (the No-BART Alternative, or NBA) is paid with property tax, sales tax and farebox revenues. The burden of local tax financing is borne primarily by households in the region, which pay a total of 69 percent of the local cost. Only 21 percent of the local tax burden ultimately is paid by businesses in the region, after a portion of business tax costs are shifted to consumers. This financing approach is no less regressive than financing capital costs, which also are paid by property and sales taxes.

I. INTRODUCTION

As the first regional rapid transit system built in the U.S. in more than 50 years, the San Francisco Bay Area Rapid Transit System (BART) is a potential learning model for metropolitan areas now considering investments in transportation facilities. BART is of additional interest to the federal government as a guide to allocating financial aid for local transportation improvements, urban development and environmental protection in urban areas. The BART Impact Program is designed to meet the needs for accurate information on the BART investment and to provide input for future transportation decisions in the Bay Area and throughout the nation.

The BART Impact Program (BIP) is a comprehensive, policy-oriented evaluation of the impacts of the BART system. The study covers the entire range of possible rapid transit impacts and includes major impact studies of Bay Area transportation systems, travel behavior, land use and urban development; of the environment, the regional economy, social institutions and life styles, and public policy. Impacts are defined, then measured and analyzed as to their effects on population groups, local areas and economic sectors.

The Economics and Finance Project of the BART Impact Program was designed to contribute to understanding what impacts construction and operation of rapid transit in the Bay Area have had on the region's economy and public finance. In terms of the region's economy, the project sought to measure the impact of expenditures for BART's construction and operation on regional sales, income and employment.

Financing these expenditures, however, also has impacts on the tax burden borne by residents of the region. The tax incidence analysis investigates who will have paid for BART by the time the debt is retired, and who pays annually for its operations. Moreover, the financing of BART's construction, given the magnitude of the cost, could have had an impact on the cost of borrowing by other public agencies or the manner in which other capital improvements are financed.

The project's scope included the study of socioeconomic impacts — such as the effect of BART on employment opportunities for minorities, the impact of BART's public expenditures on construction employment for minorities, and the employment opportunity associated with a rapid transit system.

The most difficult impact to evaluate is the influence of rapid transit — as an element of the regional infrastructure — on economic development in a region. Rapid transit improvements frequently are justified on the basis of their potential impact on a region's economic well-being. This well-being usually is associated with a region gaining an increasing share of the nation's future employment and commerce. Several causes are seen as contributing to a region's ability to attract this growth, some related to transportation services. Better access to a broader labor force and more efficient business communications are cited as transit's contribution to the competitive advantage for industry in the region. Economic growth might even be stimulated if industry chose to locate within a region because the region's image would be enhanced by a rapid transit system. This project was designed to measure any regional economic development impacts which could be traced to BART.

This report describes the findings and conclusions of the Economics and Finance Project. It is organized to follow the three major considerations of the study. First, it measures the economic and financial impacts associated with BART's construction. Second, the report evaluates the economic and financial impacts of BART's continuing operations. Finally, it documents the impact of BART's transportation service on the economic development of the region – both the impact on employment accessibility and the potential impact of BART service on the competitive advantage of industry within the region. Impacts studied in this project were those identified as regional economic impacts. Intraregional economic impacts arising from the distributional effects are being studied in the Land Use and Urban Development Project, and are being reported by that project.

The analysis and findings of each section are supported by further technical documentation in technical memoranda prepared for the BART Impact Program. A list of these memoranda appears at the end of the report.

II. RESEARCH APPROACH

The research approach developed for this study recognized the advantage of access to an economic and financial history, dating from the approval of BART's bond issue in 1962. Unlike most areas of the country in which people seek a better understanding of potential impacts which would be associated with proposed regional transportation alternatives, in the Bay Area it is possible to look at what actually has happened. In addition to observing what took place, the research approach here responds to the need to explain why changes occurred in the economy or in the financial conditions of the region during that period; but rarely is the causal mechanism clear from the changes which statistical analysis identifies. Therefore, the study relied also on key informant interviews to benefit from informed judgment in interpreting the statistical results.

The findings will be defined, to some extent, by the point of reference of comparisons. It is important not to lose sight of the fact that BART is a rapid transit system built in one region, and financed with one mix of funding sources. Transferability of the findings depends on understanding this. Further, an impact is the difference between alternatives; the relevance of any BART impact will relate to the definition of what alternative course of events might be assumed to have occurred in its absence. Finally, the extent of the geographical area used as the focus of this study will determine, to some extent, the size of the impacts.

A. Theoretical Framework

The technical approach used in the Economics and Finance Project is governed by the distinct requirements of each research objective. While this section reviews the theoretical framework of the project and its technical approaches, more detailed discussion is contained in the technical memoranda prepared for the project.

1. Expenditure Impacts

The impacts of BART's capital and operating expenditures on regional sales and income (also called gross regional product or output) were evaluated through using input-output analysis. Two input-output models of the nine-county Bay Area[1] were developed, describing the regional economy in terms of the interaction among 50 economic sectors in 1967 and 1972. The characteristics of input-output analysis permit identification of what amount of economic activity from each sector is necessary to support each dollar's worth of goods or services purchased from any single sector. Thus, the methodology allows measurement of the volume of economic activity which is generated in the region by each dollar spent for transit, construction or operations, and includes not only the dollar spent, but all the secondary or indirect impacts on sales and income. Impacts measured by the input-output models, which tell also which sectors would experience the indirect economic benefits, include consumer purchases made by families with the income earned from BART's (or its contractors') payrolls.

---

[1] The definition of the region used for this analysis and the regional definition used for other elements of the study are discussed on page 10. The nine-county region was defined as appropriate to the expenditure analysis in the Research Plan for this project.

A unique feature was included in the input-output models. Two household rows and columns were included in the dollar flow tables — one for ethnic minority households and one for non-minority households (3)[1]. When the impacts of BART's construction and operation were calculated, the presence of two household sectors permitted a direct evaluation of income effects for both minority and non-minority households.

The same input-output analysis provides estimates of the direct and total regional employment generated by BART's expenditures.

2. Construction Wage Rate

A frequently cited concern during BART's construction was its potential stimulation of inflationary pressures in the construction sector of the economy. Statistical analysis of historical wage rates and the level of BART construction employment within the region was undertaken to measure BART construction's impact on the wage rate.

3. Financial Impact and Tax Burden

The financial impact of BART's capital and operating expenditures was determined through an analysis of the incidence of the burden for each of a number of taxes which might have been considered in the financing plans. The tax incidence was considered not only in terms of who paid the tax directly, but also to whom that burden could be shifted, e.g., from the landlord to the tenant or from business to the consumer. For purposes of evaluating the equity of BART's financing, the impact was described in terms of the tax burden on a series of typical households. These households were defined in terms of different incomes, consumption patterns and family sizes.

4. Employment Opportunity

BART's expenditures for construction and operations provided the potential for a public agency to have an effect on the employment opportunity of minorities and women.

---

[1] References are numbered and appear at the end of this report.

BART's actual impact on employment opportunity objectives was evaluated through statistical review of racial and ethnic employment profiles of the BART on-site construction force and the construction work force in the San Francisco-Oakland SMSA. Similar data, as well as employment data by sex, were analyzed for the permanent employment at BART, compared to the permanent employment at other regional transit agencies. In each case, conclusions were drawn from statistical analysis, and confirmed or refuted by a program of interviewing contractors, union officials and other agencies.

5. Impact of the Bond Issue

It has been conjectured that the magnitude of the $792 million BART bond issue had a substantial effect on the cost of other public borrowing or may have led public agencies to either defer their capital projects or finance them with nonvoted debt. The impact of BART's bond issue on regional public financing was measured through statistical analysis of borrowing costs and voter behavior on bond issues. The statistical analysis provided the basis for key informant interviews within the municipal bond industry and in local government.

6. Impact of Transportation Service on Business

If BART service has had an impact on regional economic development, it would be manifested in an impact on the competitive advantage of industry within this region. The accessibility of employment to residents in the region, or conversely, the access of business to a larger work force through transit, might improve the competitive position of the region in attracting new business. The research approach dealt with the elusiveness of identifying business efficiencies or potential competitive advantages related to transit service – which might then attract new economic activity to the region – through three analytic steps: first, evaluating the differences in travel times between zones to isolate any accessibility advantages of BART which might be apparent or useful to business; second, conducting a shift/share analysis to identify any industries with unusually large growth rates since BART's bond issue was passed; and, third, extensive key informant and directed interviews to identify any causal link between BART and economic development.

B. Definition of Impact

A fundamental concept in evaluating the economic and financial impacts of BART is the definition of the term "impact" itself. In this research, an impact is defined as the difference between two courses of events, as measured against the same criterion over the same time period. The evaluation of a BART impact or a rapid transit impact is only realistic when measured against the impact of an alternative transit system which might have been in place in 1976. Figure II-1 illustrates the concept of an an impact. Since BART is not a decision which was made in isolation, but rather a decision to implement one alternative transportation system, the alternative would be some other transportation system. The impact is not represented by the absolute value of the impact variable (e.g., employment), but by the shaded area — the difference between the alternatives.

The No-BART Alternative (NBA) has been defined by the Metropolitan Transportation Commission as the transportation system judged most likely to have evolved in the central Bay Area by 1976 had the decision to build BART not been made in 1962 (10). The purpose of the NBA is to provide a realistic estimate of the net effects of BART. A consistent definition of the NBA is being used by all of the projects in the BIP.

The NBA was defined by analyzing the political and financial environment in the Bay Area at the time of the decision to build BART and in the following years in order to determine the most likely components of the NBA. These components were further reviewed in the context of actual 1976 travel demand and 1971-76 trends in the BART corridors to ensure that the level of service provided by the NBA was plausible.

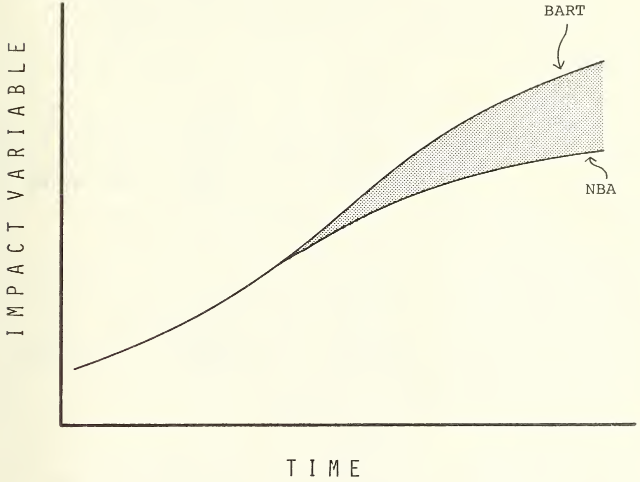
The NBA includes all freeways and principal local streets which existed in 1976, but no additional highway facilities. There are relatively minor changes in the operations of the major transit services in the central Bay Area from the actual 1971 pre-BART base to the hypothetical 1976 NBA; 1973 was found to be a peak year for provision of transit service by Greyhound (commuter buses from central Contra Costa County to downtown Oakland and San Francisco) and AC Transit's transbay commuter service. Those levels of service by those two carriers are retained in the NBA. In the NBA small improvements in frequencies in the San Francisco MUNI's routes in the Mission corridor were made, but no new routes were introduced. The only capital cost associated with the NBA is the potential addition of 15 coaches for peak-hour service in San Francisco's Mission corridor.

One major difference between the NBA and the regional transportation systems with BART is the provision of transbay transit service by BART throughout the midday off-peak period, while the NBA contains little such service from some points and none from others.

The characteristics of the NBA that are most relevant to the economic and fiscal impact analysis are summarized in Table II-2. The actual transit patronage, operating revenues and operating costs which represent the BART scenario were provided from the unaudited local transit agency reports to the Metropolitan Transportation Commission available in February 1977. The NBA scenario statistics were derived by the Metropolitan Transportation Commission based on patronage expectations and operation requirements of the NBA network.

Figure II-1

ILLUSTRATION OF THE IMPACT FRAMEWORK



The impact is represented by the shaded area.

Given the limitations in the analytical and theoretical state-of-the-art to forecast the future, the NBA is defined only as a transportation system alternative. It thus assumes no changes in the population, employment and land use distributions from the actual case in 1976. There are inherent limitations to the amount of detail possible in the NBA description, given this single-minded definition. For example, while travel demand and accessibility can be estimated with some detail, the local NBA zoning policies have to be more judgmental and generalized. The

Table II-2

A SUMMARY OF THE BART AND NBA SCENARIOS
(All figures are in thousands)

Agency	BART Scenario	NBA Scenario	Difference
TRANSIT PATRONAGE - Annual One-Way Person Trips (1976)			
Bay Area Rapid Transit District	32,900	0	32,900
Alameda-Contra Costa Transit District	52,300	55,500	- 3,200
San Francisco Municipal Railway	104,900	116,000	- 11,100
Greyhound Bus Lines	500	3,000	- 2,500
TOTAL	190,600	174,500	16,100
OPERATING REVENUES (Fares - Total in 1975/76)			
Bay Area Rapid Transit District	$23,221	$ 0	$23,221
Alameda-Contra Costa Transit District	16,187	18,537	- 2,350
San Francisco Municipal Railway	22,426	25,064	- 2,638
TOTAL	$61,834	$43,601	$18,223
OPERATING COSTS (1975/1976)			
Bay Area Rapid Transit District	$ 55,853	$ 0	$55,853
Alameda-Contra Costa Transit District	40,449	41,900	- 1,451
San Francisco Municipal Railway	72,179	79,900	- 7,721
TOTAL	$168,481	$121,800	$46,681
DEFICIT (1975/1976)			
Bay Area Rapid Transit District	$ 32,632	$ 0	$32,632
Alameda-Contra Costa Transit District	24,262	23,363	899
San Francisco Municipal Railway	49,748	54,836	- 5,088
TOTAL	$106,642	$78,199	$28,443

Source: "The NBA Financing Plan" and "Estimates of Operating Expenses and Revenues for the No-BART Alternative," Working Notes prepared by the Metropolitan Transportation Commission, February 1977. BART Scenario Patronage totals were modified by MTC in December 1977 based on the Transportation Development Act Annual Report, 1975-1976. Cost and revenue figures were affected to a minor extent.

effects of the NBA therefore cannot be as thoroughly measured as those effects experienced by the region with BART. Each project has established the most appropriate role for NBA comparisons consistent with these limitations.

This definition of the NBA, although it minimizes the transportation service impacts of BART, is probably not unrealistic. Until 1972, this system was meeting the transbay and regional demand without BART. It is a highly developed bus and highway network. Changing the components of the NBA within any reasonable tolerance might change the measurement of the impacts, but probably not the implications.

The definition of the NBA, with a capital cost equivalent to only 15 additional buses, results in a direct capital expenditure impact from BART virtually identical to the capital cost of BART. The BART financing plan represents the entire BART capital financing impact, since the alternative is virtually no cost.

The importance of the NBA becomes more evident in measuring the impact of BART operations on the economy or the local tax burden. The impact is the difference between the cost of operating BART and the cost of operating the NBA. The impact of BART operating expenditures, then, is $46 million annually, although BART's budget is $59 million. The difference between the BART budget and impact represents the $13 million it would cost to operate alternative bus transit service (the NBA financing plan for operating the fifteen additional coaches on MUNI; the increased operating cost of maintaining a constant level of service for greater patronage with other existing public fleets; as well as the additional cost to Greyhound to maintain its suburban network).

Measuring the impact of BART's financing relies on the same principle of an impact representing a difference between two courses of events. The tax burden an individual bears with BART less the tax burden borne without BART will be the impact on tax burden. If taxes are identical under both scenarios, the tax burden is identical. On the other hand, the taxes may be identical, but spent on different services in the two scenarios; that becomes a public service impact, although there would still be no tax burden impact.

The importance of this concept of an impact is that it is the only framework within which the implication of a policy choice is clear. After all, a decision is a choice between different alternatives at the same point in time, not a choice between the status quo and the future.

C. Definition of the Region

In addition to the alternative against which BART's impacts were measured, the definition of the region will influence the magnitude of the impacts. Except where the region to be evaluated was specified by the Metropolitan Transportation Commission, the definition of the region was determined as the most relevant geographic area to the research question. Several different "regions" are used in this report, but are clearly identified and the differing definitions were used to highlight, not obfuscate, the relative importance of findings.

1. Expenditure Impacts

The economic impact analysis of capital and operating expenditures was based on a nine-county input-output model, encompassing the traditional political geography of the Bay Area -- the counties of Alameda, Contra Costa, San Francisco, Santa Clara, San Mateo, Marin, Sonoma, Napa and Solano. This regional definition was specified by the Metropolitan Transportation Commission.

This nine-county basis, although larger than the three-county BART District, is not inappropriate. If BART's original planners and advocates had not considered the region to be larger than the current three BART counties, the political momentum which eventually resulted in the BART District's formation may never have succeeded. BART was planned on the basis of its potential economic impact on more than three counties alone. It was then, and still is, considered an interrelated economy of at least six counties.

If a six-county (BART's original Phase I and II system) or three-county region had been used in evaluating the expenditure impacts, the size of the impacts on employment or sales would have been smaller, since the employment or materials purchased outside the "region" would have included Bay Area workers and goods. The relative impact probably would not have changed substantially.

2. Economic Development Impacts

In identifying any impact BART may have had in increasing the employment and commerce in the region as a result of its service, the appropriate regional definition was determined to be the three BART counties, since none of the others would experience significantly different transportation service (or image) as a result of BART. The shift/share analysis and interviews focused heavily upon the three BART counties, although the analysis also pursued corporate location behavior in Santa Clara, San Mateo and Marin counties. The additional three counties were included to provide some control area perspective on the analysis and to isolate any intraregional shifts within the nine-county region. (Intraregional shifts within the three-county region are a potential impact being explored by the Land Use and Urban Development Project.)

3. The Financial Impacts

The financing of BART was based on a taxing district of three counties. The financial impacts were measured only where they were experienced to any significant degree within the taxing district. The tax burden analysis explored the impact of BART on the households and businesses of Alameda, Contra Costa, and San Francisco counties.

Similarly, the impact of BART's bond issue on the cost of public borrowing would be expected to occur in those counties where the BART debt had an impact on the total public indebtedness. Again, the appropriate regional definition was the three-county BART District. On the other hand, the analysis was occasionally extended beyond those three counties -- selectively exploring the results of the same analytic techniques in Santa Clara, San Mateo or Marin counties -- for purposes of perspective and to seek control situations for the analysis.

4. Labor Market Analysis

In seeking to measure the relative effectiveness of BART in improving employment opportunities for minorities and women, the construction work force of the San Francisco-Oakland SMSA was used as the base because it represented the primary labor pool (which does not imply that some portion of the work force did not commute from outside the SMSA).

In comparing the racial and sexual characteristics of BART's operating work force with an alternative work force, the appropriate comparison is the work force of other public transit agencies which might provide service without BART, e.g., MUNI and AC Transit.

D. Limitations on Transferability of Findings

Insofar as the BART Impact Program intended to measure the specific impacts of BART on the San Francisco Bay Area, the application of the specific impacts to policy deliberations elsewhere must be done carefully. The broader policy implications of these findings, which are identified in the final section of this report, have greater transferability.

As was stated earlier, because of analytical and theoretical limitations in forecasting the future, the definition of the No-BART Alternative was restricted by the BART Impact Program to transportation system improvements alone. An NBA with non-transportation dimensions, including shifting land use patterns or schedules for publicly financed redevelopment, would have caused its own cost and revenue implications.

The Land Use and Urban Development Project of the BART Impact Program will assess the intraregional impacts which were excluded from this project's assignment. The scope of activities to be studied in the Land Use and Urban Development Project include: decisions about the location of residences, activities and urban development within the Bay Area; the behavior of the market for real property which exercises a major influence on such locations; and the resultant spatial distributions of people, activities and development within the region. It is scheduled for completion in mid-1978.

The definition of the transportation aspects of the No-BART Alternative is not unreasonable. There might have been an increase in service levels in the absence of BART, or there may have been the implementation of exclusive bus lanes, with associated capital costs. While these modifications to the No-BART Alternative would change the complexity of the answer and identify small shifts in tax burden or benefits, the magnitude of the changes in costs or the level of financing from different sources would not be sufficient to change the conclusions.

III. THE ECONOMIC AND FINANCIAL IMPACT OF BART'S CAPITAL EXPENDITURES

The economic and financial impact of constructing a regional transit system should be considered quite independently from the impact associated with the operation and service of a regional transit system, once it is in place. To some extent, the impact of constructing a transit system can be considered in the same context as evaluating the impacts of any major public works project. The impacts of spending money on a major construction project will occur, whether or not this system ultimately meets its transportation objectives. The tax burden associated with financing the local share of that capital investment will also occur, regardless of the system's eventual performance. This section reviews the expenditure impacts on the economy, the impact which a major public project can have on employment opportunity and inflationary pressures in the construction industry, the tax burden associated with financing BART, and the impact of BART's bond issue on the cost of borrowing and the financing of other public projects.

A. The Direct and Indirect Impacts of Construction Expenditures on Regional Sales, Employment and Income

The most significant immediate economic impact of implementing a rapid transit system involving a fixed guideway is the impact of construction and equipment expenditures.[1] To the extent that building rapid transit is not dissimilar from any other major public works project -- it is a massive expenditure of funds which will vary only in the object of the expenditures -- this section addresses the direct and indirect impacts of any public construction expenditure on the region, as well as BART's construction impacts. This observation bears on the transferability of the findings for other public works, as well as in other regions; it also relates to the policy implications of justifying transit in an economic development context.

The expenditure impacts on regional sales, income and employment are measured with a regional input-output methodology applied to the nine-county economy.[2]

The impact is measured as the direct impact, relative to the goods and services which were purchased within the region from the construction expenditures, as well as the indirect and induced impacts. The indirect impacts represent intermediate transactions: purchasing a $350,000 transit car involves the car manufacturer's making intermediate purchases of steel, seats, glass, etc. Each of these intermediate purchases also stimulates intermediate purchases (or requirements). All of these purchases of goods and services which occur within the region are included in total impacts. Induced expenditures are those purchases made by households with the income they earn from the direct and indirect expenditures. The induced expenditure impacts are also included in this analysis.

---

[1] This section focuses on the impacts of BART's capital expenditures, including the costs of constructing and equipping BART. For ease of reference, the text frequently mentions the costs or impacts of "constructing" BART, which should be understood to include the cost of BART's equipment, including rolling stock.

[2] The regional input-output model and its capabilities are summarized in Section II.

This regional input-output analysis confines the impacts to those experienced within the region. The analysis does not attempt to define the sales, employment or income impacts of constructing rapid transit generally, but rather it seeks to identify the economic effects on the region in which BART was built.

Two secondary impacts are evaluated in this section: first, the impact of a major public construction project on employment opportunities for minorities and, second, the impact of a project requiring significant expenditures on construction on the wage rate of the construction work force.

1. The Cost of Building BART (Direct Expenditures)

The cost of building BART was estimated at $994 million in 1962. For a substantial number of reasons, not least that BART was leading the way in a new technology of rapid transit, while experiencing construction delays in an era of unprecedented inflation, the capital costs have increased until the estimate of the cost is now cited as over $1.5 billion. And this total does not include over $715 million in interest on the general obligation bonds or the $38 million in interest in sales tax revenue.

The total costs used in measuring BART's economic impacts are summarized in Table III-1 by the economic sectors in which they were incurred.[1] The table illustrates the dollar amount spent for different types of goods and services within the region, which totals $1.2 billion, or 79 percent of the total cost. The remainder represents costs for goods and services which were purchased outside the region.

The impact of BART's capital expenditures on regional output, employment and income is a function of the magnitude of the expenditures and the proportion of the expenditures which results in purchases of goods or services produced within the region. Furthermore, the ultimate economic impact, including the direct and indirect impacts, requires an understanding of

---

[1] The cost total of $1.524 billion was determined from a review of BART contract files, and disallows current expenditures for capital equipment which might be deemed replacement equipment (7).

Table III-1

REGIONAL SALES AND INCOME EFFECTS FROM BART CONSTRUCTION 1964-1976

(In Millions of Dollars)

SF BAY I-O SECTOR DESCRIPTIONS	DIRECT INVESTMENT	TOTAL IMPACT
1. AGRICULTURE AND MINING	0.000	17.003
2. NEW RESIDENTIAL CONSTRUCTION	0.000	0.000
3. NEW BUILDING CONSTRUCTION	153.410	153.410
4. NEW UTILITIES CONSTRUCTION	18.600	18.600
5. NEW HIGHWAY CONSTRUCTION	116.510	116.510
6. NEW CONSTRUCTION ALL OTHER	466.790	466.790
7. MAINT. AND REPAIR CONSTRUCTION	1.906	15.372
8. ORDINANCE	0.000	.390
9. FOOD PROCESSING	0.000	71.817
10. TEXTILE PRODUCTS	0.000	10.197
11. LUMBER AND WOOD PRODUCTS	0.000	0.000
12. FURNITURE PRODUCTS	0.000	3.960
13. PAPER AND ALLIED PRODUCTS	0.000	10.947
14. PRINTING AND PUBLISHING	0.000	13.649
15. CHEMICALS AND PLASTIC PRODUCTS	0.000	20.705
16. PETROLEUM REFINING	.020	35.825
17. RUBBER AND LEATHER PRODUCTS	0.000	7.367
18. STONE AND CLAY PRODUCTS	6.690	53.258
19. PRIMARY IRON AND STEEL	0.000	11.637
20. PRIMARY NON-FERROUS METALS	8.980	12.691
21. METAL CONTAINERS	0.000	4.025
22. FABRICATED METAL PRODUCTS	29.170	63.088
23. MACHINE SHOP PRODUCTS	.140	2.319
24. OTHER FABRICATED METAL PRODUCT	1.550	11.535
25. CONST. AND MATERIALS HANDLING	1.600	4.353
26. METAL WORKING EQUIPMENT	0.000	.589
27. GENERAL INDUSTRIAL MACHINERY	.080	3.381
28. OFFICE AND COMPUTING MACHINERY	9.080	11.808
29. SERVICE INDUSTRY MACHINES	1.250	3.227
30. ELECT. TRANSMISSION EQUIP.	4.440	7.177
31. OTHER ELECTRICAL EQUIP.	.021	4.914
32. COMMUNICATION EQUIPMENT	2.340	8.689
33. ELECTRONIC COMPONENTS AND EQUI	0.000	2.463
34. MOTOR VEHICLES AND EQUIPMENT	.130	27.762
35. AIRCRAFT AND PARTS	0.000	.108
36. OTHER TRANSPORTATION EQUIP.	.010	.807
37. SCIENTIFIC INSTRUMENTS	.080	2.248
38. MISCELLANEOUS MANUFACTURING	5.880	9.129
39. TRANSPORTATION AND WHAREHOUSING	.980	61.828
40. COMMUNICATIONS	0.000	21.379
41. ELECT. AND GAS UTILITIES	0.000	30.620
42. WHOLESALE AND RETAIL TRADE	0.000	165.590
43. FINANCE AND INSURANCE	.943	62.378
44. REAL ESTATE AND RENTAL	8.221	92.021
45. PERSONAL SERVICES	0.000	25.021
46. BUSINESS SERVICES	3.460	79.026
47. AUTOMOBILE REPAIR AND AMUSEMENT	0.000	45.162
48. MEDICAL AND NON-PROFIT SERVICE	0.000	54.195
49. GOVERMENT ENTERPRISES	0.000	10.920
50. PUBLIC TRANSIT FACILITIES	0.000	1.254
51. MINORITY INCOME	.347	115.598
52. NON-MINORITY INCOME	1.304	811.200
53. ***LANDSCAPING SERVICES	4.380	4.380
54. ***STATION CONSTRUCTION	47.250	47.250
55. ***SERVICE FACILITIES CONST.	4.900	4.900
56. ***OFFICE BUILDING CONSTRUCTION	4.790	4.790
57. ***RAIL CONSTRUCTION	70.820	70.820
58. ***BARTD OPERATIONS	5.240	5.240
59. ***TRANSIT SYSTEM MAINT. AND R	2.770	2.770
60. ***PROFESSIONAL AND ADMIN. SER	195.950	195.950
61. ***UTILITIES MAINT. AND REPAIR	18.600	18.600
62. ***LT. RAIL TRANSIT CONSTRUCTI	1.310	1.310
TOTAL EXPENDITURES WITHIN THE BAY REGION	1,200.212	
EXPENDITURES OUTSIDE THE REGION	323.731	
TOTAL	1,523.942	3,139.952

the purchasing and production patterns of the region's industry. A contract awarded to a firm in the region may result in that firm purchasing equipment or services within the region or elsewhere in the country. The regional economic impact of BART will consist of only those impacts in sales or incomes which occur inside the nine-county region.

In the case of extraregional contracts, an assumption was made on the percentage of those dollar amounts which were spent as direct expenditures within the region. In the case of construction contracts, it was assumed that 75 percent of the value was spent within the region for local employment and material, regardless of the contractor's headquarters location (7). In the case of procurement contracts, only 10 percent were assumed to have resulted in a regional expenditure, since the majority of the technological equipment required by BART was manufactured and assembled outside the region (7). These estimates were supported in union and contractor interviews. But even when a direct expenditure is 100 percent local, the import sector will absorb 30 to 40 percent of the total sales impact as intermediate goods are purchased or produced outside the region.

The nature of impact analysis behooves consideration of the capital costs of more than BART alone. Since an impact represents the difference between two events, measuring the impact of BART's capital expenditures involves reducing the cost of BART by the amount of the capital expenditures which would have been associated with the No-BART Alternative (NBA), or the transit system which would have existed today in the absence of BART.

The capital cost associated with the No-BART Alternative was specified as the cost of 15 additional coaches, all of which would have been built outside of the region. Therefore, they would have appeared in the import sector in the input-output analysis, with no effect on the regional economy (other than in terms of operating costs, which are treated elsewhere). As a result, the total cost of building BART has been assumed to be the BART impact, i.e., the difference between BART and the NBA.

2. Impacts on Regional Sales and Income

The effect of BART's capital expenditures on the regional economy was not a large percentage of the nine-county region's gross regional product, although there is no question it was a large project. The $1.2 billion spent in the Bay Area over a 12-year period generated total sales and income of $3.1 billion to support the construction and procurement activity. Given the strength of the regional economy, the relative impact is slight. In no single year did BART's impact on regional sales and income exceed one-half of one percent of gross regional product.

Table III-1 lists the direct and total impacts on the region's economic sectors. The second column of Table III-1 illustrates all of the eventual expenditure impacts of the initial direct expenditures. Thus, $17 million was eventually spent in the region's agricultural and mining industries (Sector 1) for either manufacturers' purchased raw materials or the region's agricultural-industry produced foodstuffs purchased by workers employed on the construction project. The second column, then, represents for each sector the purchases made from all the sectors experiencing direct expenditure impacts. These figures represent only the dollar flows inside the region. When a direct or indirect purchase is made outside the region, its effect on the local economy is lost.

The direct expenditure impacts are in the sectors one might expect: construction, maintenance, metals, business equipment and services, and real estate. The total impacts illustrated in the tables include the direct expenditures made for BART, and the indirect and induced expenditures. Thus, impacts from BART's construction are experienced in the purchase of motor vehicles or retail trade, amusement and medical services, all induced expenditures from household income earned through the direct or indirect requirements of BART's construction.

3. Regional Employment Effects

BART's construction also had a large positive impact on employment within the region over the 12-year construction history. The direct requirements for constructing BART were equivalent to nearly 31,000 person-years of employment. The indirect employment requirements raised the total regional employment impact to over 75,000 person-years.[1]

The BART construction work force, while seemingly large, was never a major proportion of regional construction employment, which hovered near 90,000 in the nine counties throughout the sixties. In the peak construction year, 1968, BART required 5,000 construction workers. This relative observation, however, should not diminish the impact of BART-related employment on workers hired as part of the 75,000 person years of employment.

Table III-2 illustrates each of the economic sectors in which there was a direct or indirect employment impact to support BART's construction over the full construction period. While BART clearly had an employment impact, it did not increase employment significantly over its previous levels. The impact of BART may have been to diminish unemployment in a period of hesitation in the economy, but the entire employment impact, if

---

1. These figures cannot be translated simply into jobs, however. In construction contracting, employment tenure can last from a matter of weeks to years; without knowing the distribution of the workers' length of employment, it is not possible to estimate the number of individuals employed for the person-years' equivalence.

Table III-2

REGIONAL EMPLOYMENT EFFECTS FROM BART'S CONSTRUCTION, 1964-1976
(In Person-Years)

SF BAY I-O SECTOR DESCRIPTIONS	DIRECT	TOTAL
1. AGRICULTURE AND MINING	0.	874.
2. NEW RESIDENTIAL CONSTRUCTION	0.	0.
3. NEW BUILDING CONSTRUCTION	2051.	2051.
4. NEW UTILITIES CONSTRUCTION	413.	413.
5. NEW HIGHWAY CONSTRUCTION	2313.	2313.
6. NEW CONSTRUCTION ALL OTHER	8778.	8778.
7. MAINT. AND REPAIR CONSTRUCTION	88.	638.
8. ORDINANCE	0.	6.
9. FOOD PROCESSING	0.	1363.
10. TEXTILE PRODUCTS	0.	561.
11. LUMBER AND WOOD PRODUCTS	0.	0.
12. FURNITURE PRODUCTS	0.	158.
13. PAPER AND ALLIED PRODUCTS	0.	231.
14. PRINTING AND PUBLISHING	0.	498.
15. CHEMICALS AND PLASTIC PRODUCTS	0.	392.
16. PETROLEUM REFINING	0.	403.
17. RUBBER AND LEATHER PRODUCTS	0.	178.
18. STONE AND CLAY PRODUCTS	197.	1606.
19. PRIMARY IRON AND STEEL	0.	309.
20. PRIMARY NON-FERROUS METALS	235.	337.
21. METAL CONTAINERS	0.	110.
22. FABRICATED METAL PRODUCTS	1236.	2682.
23. MACHINE SHOP PRODUCTS	5.	90.
24. OTHER FABRICATED METAL PRODUCT	71.	522.
25. CONST. AND MATERIALS HANDLING	67.	180.
26. METAL WORKING EQUIPMENT	0.	26.
27. GENERAL INDUSTRIAL MACHINERY	5.	185.
28. OFFICE AND COMPUTING MACHINERY	174.	226.
29. SERVICE INDUSTRY MACHINES	30.	77.
30. ELECT. TRANSMISSION EQUIP.	105.	168.
31. OTHER ELECTRICAL EQUIP.	1.	136.
32. COMMUNICATION EQUIPMENT	76.	270.
33. ELECTRONIC COMPONENTS AND EQUI	0.	93.
34. MOTOR VEHICLES AND EQUIPMENT	1.	343.
35. AIRCRAFT AND PARTS	0.	1.
36. OTHER TRANSPORTATION EQUIP.	1.	49.
37. SCIENTIFIC INSTRUMENTS	3.	67.
38. MISCELLANEOUS MANUFACTURING	307.	476.
39. TRANSPORTATION AND WHAREHOUSING	42.	2426.
40. COMMUNICATIONS	0.	727.
41. ELECT. AND GAS UTILITIES	0.	1040.
42. WHOLESALE AND RETAIL TRADE	0.	14055.
43. FINANCE AND INSURANCE	78.	4272.
44. REAL ESTATE AND RENTAL	56.	518.
45. PERSONAL SERVICES	0.	721.
46. BUSINESS SERVICES	220.	4302.
47. AUTOMOBILE REPAIR AND AMUSEMENT	0.	1912.
48. MEDICAL AND NON-PROFIT SERVICE	0.	3880.
49. GOVERMENT ENTERPRISES	0.	201.
50. PUBLIC TRANSIT FACILITIES	0.	52.
51. MINORITY INCOME	0.	0.
52. NON-MINORITY INCOME	0.	0.
53. ***LANDSCAPING SERVICES	88.	88.
54. ***STATION CONSTRUCTION	645.	645.
55. ***SERVICE FACILITIES CONST.	67.	67.
56. ***OFFICE BUILDING CONSTRUCTION	63.	63.
57. ***RAIL CONSTRUCTION	1573.	1573.
58. ***BARTD OPERATIONS	89.	89.
59. ***TRANSIT SYSTEM MAINT. AND R	90.	90.
60. ***PROFESSIONAL AND ADMIN. SER	10660.	10660.
61. ***UTILITIES MAINT. AND REPAIR	781.	781.
62. ***LT. RAIL TRANSIT CONSTRUCTI	29.	29.
63. TOTAL MAN-YEAR EQUIVALENTS	30645.	75009.

SOURCE: McDonald & Grefe, Inc.

averaged over the 12-year period, was never more than one-half of one percent of regional employment. On the other hand, this could have represented as much as one-fifth of the 2.5-3.0 percent annual employment growth in the region during the same period, which is significant.

4. The Impact on Minority Employment Opportunity

The previous section addressed the total regional employment effects from constructing BART. A very important public policy concern related to overall employment effects, however, is the impact that a major public works construction project like BART has on a public objective of increasing minority employment opportunity within the work force.[1] The current policy objectives of increasing minority employment opportunity, which were not explicitly adopted by BART at the early date of its construction, include increasing minority employment in specific trades and generally within the total construction work force. Naturally, it would be ideal if the employment on a public project could be leveraged to have a residual effect on minority opportunity throughout the region. This, however, would entail apprenticeship opportunity and skills improvement, as well as employment.

In reviewing the record of minority employment during BART's construction, BART's construction activity, even in its heaviest year, represented less than 5% of the San Francisco-Oakland SMSA construction employment. The BART experience, then, was not really a highly visible one, statistically. On the other hand, it created a working relationship between minority employees and contractors and minority employees and unions, which could have residual effects for minority employment opportunities in the future.[2]

The SMSA has been used as the appropriate regional definition for the labor market, because of the concentration of potential minority employees and the San Francisco-Oakland location of contractors' hiring offices.

Minorities represented 36 percent of the total construction work force on the BART project, while for the SMSA as a whole, minority groups represented only 22 percent of the work force. The major difference was in the Black segment of the work force, which represented only nine percent of the SMSA total, but captured 22 percent of the labor requirements for BART's construction. Spanish-American workers were also better represented in BART's work force than they were in construction employment throughout the SMSA. BART fared less well in employing American Indian, Japanese, Chinese, Filipino, Hawaiian, Korean or other ethnic groups in its work force.

---

[1] In this research, minorities were defined as Black, Spanish-American, American Indians, Japanese, Chinese, Filipinos, Hawaiians, Koreans and other nonwhites, the EEOC definition.

[2] Discrepancies in data on the total number of construction workers will occur, based on the sources cited. The distinction should be maintained, however, between direct employment required to support BART's construction expenditures, which will include many more sectors than construction alone, and on-site construction employment.

If it is a policy objective for public works projects to provide the opportunity to enhance the job skills of unemployed minority workers, the true test of a public project's effect on minority construction employment is the craft and skill level at which minorities are employed. Most of the construction workers employed for BART construction were laborers, a nonapprenticeable craft. This issue of whether a public transit project can assist minorities in gaining access to an apprenticeable craft is important. Apprenticeship leads to job skills which enhance the income earning potential of a worker. If minority employment opportunities had been fully exploited, the workers involved in BART's construction would have emerged with greater job skills than before working on the project. But this opportunity is only fully seized if the unemployed are able to gain the apprenticeship training they cannot gain while they are unemployed. Nonetheless, frequently laborers are hired for day labor, which requires no training.

The only data available for comparison by craft and skill level were data on the SMSA minority population and BART's minority construction employment; no data were available for SMSA construction workers. The craft statistics for minority workers generally were taken from construction union membership data, which indicate the number of minorities who were members of specific building trades unions. All BART construction workers were, by requirement, building trade union members.

The number of minority workers in the BART construction work force, by skill level, are summarized in Table III-3. This table summarizes the data for the period 1967 to 1971, the period of the majority of construction. The data contained in this table, while the most complete available, is not exhaustive. It is based on a sample of the work force derived by BART's random selection of work sites.

Although 35 percent of the on-site work force were minority workers, 2,731 of the minority workers were laborers. This represented 68 percent of all minorities employed. The summary in Table III-3 reports numbers of minorities employed in each skill level and total minorities excluding laborers (the latter in brackets).

Although 38 percent of all journeymen were minorities, only 20 percent were minorities if laborers are excluded. Only 20 percent of the foremen were minorities, as well. With the laborer work classification excluded, only 11 percent of the

Table III-3

BART ON-SITE CONSTRUCTION WORK FORCE BY SKILL LEVEL AND ETHNIC CHARACTERISTICS

SUMMARY

1967-1971

Skill Level	Total		Black		Hispanic		Asian		American Indian	
Apprentice	638	(631)[1]	49	(45)	28	(27)	5	(5)	6	(6)
Journeymen and laborers	9,522	(5,492)	2,284	(599)	1,179	(356)	54	(27)	122	(96)
Foreman	1,296	(877)	151	(52)	91	(34)	1	(1)	19	(19)
GRAND TOTAL	11,456	(7,000)	2,484	(696)	1,298	(417)	60	(33)	147	(11)
Percent	100	(100)	22	(10)	11	(6)	1	(0.1)	1	(0.1)

---

[1] Numbers in () represent totals or percents excluding laborers.

Source: BART Construction Contractor and Subcontractor Ethnic Data Counts, 1967-1971.

foremen were minorities. These statistics emphasize the transitory nature of minority construction employment in aiding minority workers in their long-term employment potential.

While BART was not exemplary in increasing minority participation as electricians, plumbers or carpenters, the percentage of minority laborers (which averaged 61 percent over the term of BART's construction) was almost double the minority representation in the union work force classified as laborer. These statistics should also indicate that minorities were not given any preferential treatment in the nonlaborer trades (indicative of reverse discrimination), but were referred by the unions at the same rate as any other union members. Interviews with representatives of the construction contractors, trade union council, the Contract Compliance Agency and BART resulted in a general concurrence that BART helped introduce the concept of affirmative action or equal employment opportunity to many of the construction trades within the region. Compliance enforcement was not very stringent during the early BART construction years. As a result, these findings may prove to be less applicable in assessing the potential impact of future transit construction than the current experience in Atlanta, Washington or elsewhere.

5. The Impact on Construction Wage Rates

It has been suggested that a public project as large as the construction of a regional rapid transit system could have inflationary effects on a regional economy, which may work counter to anti-inflation policies or increase the cost of other public construction. This inflationary pressure would be apparent in construction wage rates.

This research indicates that BART construction expenditures alone had little apparent effect on wage rates in the building trades in the Bay Area. Although Bay Area construction wages rose 40 percent during the years in which major BART construction was occurring (1964-1969), this increase was consistent with longer-term trends, and does not appear attributable to BART construction expenditures in particular. This conclusion is based upon statistical analysis of the components of wage rate increases -- the usual inertia of wage increases, the inflationary element of increases which respond to general inflation, and the supply and demand considerations specific to the Bay Area -- and upon a consideration of explanatory factors in the Bay Area construction labor market.

The statistical analysis, using several regression models, failed to reveal any significant correlation between BART construction activity and heavy construction wage rate changes in the Bay Area (7).

In order to confirm that the statistical findings were consistent with what is known of the causal factors, several aspects of the construction labor market were investigated. It was hypothesized that BART construction would affect construction wages only if BART's construction employment played a major role in an overall increase in construction jobs (at a time of fairly full employment in the industry). By causing an increase in demand for labor in a market where labor was in limited supply, the price of labor would be expected to rise.

As noted previously, during BART's chief construction period, overall construction employment did not substantially rise, nor did BART on-site construction employment account for more than 4.7 percent of the San Francisco-Oakland SMSA construction employment at any one time. The peak of BART construction employment, in fact, appeared to coincide with a period of relatively lower employment levels in the construction industry as a whole.[1] Even this figure exaggerates BART's impact on the local labor market, as the market for much of the specialized work involved in rapid transit construction extends far beyond the nine Bay Area counties.

Subsequent interviews with construction union officials supported this line of reasoning.

Given these assumptions, it appears that the level of construction employment during BART's chief construction years was about average for the long-term trend, but that the unemployment level may have increased in BART's peak years, 1967-1968.

Interviews with construction union officials of both the Teamsters and AFL-CIO organizations supported the conclusions suggested by the labor market analysis. One union official noted that construction union contracts are generally of three years' duration, and thus, their wages are not usually influenced by individual construction contracts such as those for each of BART's segments. The other union representative agreed that BART construction, in this case, had no significant impact on Bay Area construction wage rates. He argued that had there been full employment in the industry, a project of BART's scale might have boosted wage rates significantly.

A consideration of labor supply and demand factors that might affect construction wages thus appears to bear out the conclusions reached through statistical analysis. BART construction was a short-term, relatively minor source of employment in terms of the regional labor market, although it did create 31,000 person-years of direct employment over twelve years. It coincided with no increases in overall construction employment and, in fact, appeared to peak at a time of relatively low employment in the construction industry.

---

[1] This indication that BART construction occurred during a relatively slow period in the Bay Area construction industry is supported by the results of a shift/share analysis of the regional economy undertaken for this project. The shift/share analysis indicated that the Bay Area construction industry experienced a relative competitive disadvantage over the level of activity which might have been expected in the Bay Area during the period 1965-1973, given the region's industrial mix and the national trend.

The increases in construction wage rates that occurred over BART's chief construction period corresponded to increases in the cost of living and to increases in construction wages nationally, as they did in the years preceding and following BART's construction. These factors, rather than shifts in the market for construction labor, appear to explain the increases in construction wage rates during BART construction.

6. Regional Income Effects

A frequent aspect of describing a major public works project's benefits to a region, particularly those projects which require substantial local funding, is the effect capital expenditures will have on household income. The income effects presented in this section have been estimated with the input-output model. The figures must be viewed in perspective. They represent a gross augmentation of household incomes in the region from direct and indirect expenditures for construction. This analysis was structured to evaluate independently the effects on non-minority and minority households.

Household income in the region increased an estimated $927 million due to BART's capital expenditures, less than one-half of one percent of the total estimated personal income in the region during that period.[1] Approximately 12.5 percent of the impact on household incomes accrued to minority households.

B. The Tax Burden and Financial Impact of Constructing BART

This section describes the financing plan for building BART and identifies which sectors of the population will have borne the burden of paying for BART's construction by the time the construction bonds have been retired in 1999. For further description, see (5). The incidence of the tax burden borne by residents of the State or the nation is not identified specifically.

The financial burden of BART falls primarily on residents of the system's taxing district, which comprises San Francisco, Alameda and Contra Costa counties. As a result, the regional definition for tax burden analysis and the fiscal implications is appropriately the three-county BART District.

---

[1] No attempt should be made to compare the increase in household income with households financing burden to compute a benefit-cost ratio for households. The income effects were experienced only by selected households (not all households), and the financing burden is distributed by the income and consumption characteristics of households.

1. The Impact of BART Capital Financing

The impact of BART capital financing is governed by the cost of BART and the methods used to finance that cost. At the time BART was proposed, in 1962, it was to be funded from the sale of $792 million worth of general obligation bonds, to be repaid from property tax revenues, and was to receive $135 million of support from the California Toll Bridge Authority from toll revenue bonds. Rolling equipment was to be purchased with nearly $73 million worth of revenue bonds based on operating revenues projected for BART service.

BART's actual financing is summarized in Table III-4. An additional $12 million in general obligation bonds, to be repaid from the property tax of Berkeley alone, was issued to pay for the undergrounding of the line in Berkeley. The support from toll revenues has increased, as the cost of the Tube and its approaches increased. With recognition of the unlikelihood of operating surpluses, the rolling equipment was financed with sales tax revenue bonds, rather than transit revenue bonds. Federal grants and miscellaneous other sources also contributed to BART's financing.

A major element of the cost which is not frequently emphasized as a BART capital cost is the total interest expense on each of the bond issues. This interest expense, which is repaid from the same source as the retirement bond principal, totals $763 million. A very important early decision in the financial planning of BART, as far as public acceptability of the cost was concerned, was to avoid capitalizing the interest for the bonds. While this interest expense seems substantial, to the credit of BART's financial advisors, BART was able to issue its entire bonded indebtedness at an average interest rate of 4.14 percent, barely above the original estimates of four percent.

The impact of BART capital financing, as with any impact, is the difference between BART's capital financing and the capital financing of the No-BART Alternative (NBA). It has been assumed that the NBA would incur no capital costs which would require local financing. This assumption means that any BART tax burden is also the full impact of BART.

One characteristic of BART's financing which is unusual today, and will have implications for the transferability of these findings, is the large portion which was funded locally. The local taxpayers have paid or will pay over $1.7 billion in local property and sales taxes for retirement of the BART capital debt and its associated interest. In an era during which the federal government has begun to assume 80 percent of the capital costs of new transit systems, the magnitude of the Bay Area's local commitment may not be equaled for some time. Thus, the magnitude of the impact of BART's financing on the local taxpayer will exceed that applicable in other regions.

Table III-4

THE FINANCING PLAN FOR BART CONSTRUCTION
(Millions of Current Dollars)

Uses of Funds	Amount (000,000s)	
BART Capital Cost Expenditures		1,524
Interest on General Obligation Bonds	714	
Interest on Series "A" Bonds	10	
Interest Cost on Construction or Capital Equipment	38	762
ESTIMATED TOTAL COST		$2,286

Sources of Funds	Amount (000,000s)	
Proceeds of Sale of Property Tax-Financed Bonds	792	
Series "A" Bonds - Berkeley undergrounding	12	
Interest on Property Tax-Financed Bonds	724	
TOTAL PROPERTY TAX OBLIGATION		1,528
Proceeds of Sales Tax Revenue Bonds	150	
Interest on Sales Tax Revenue Bonds	38	
TOTAL SALES TAX OBLIGATION		188
California Toll Bridge Authority		176
Federal Capital Grants		315
Other[1]		79
Earnings from Temporary Investments		
Transit Development Act Grants		
Agency Agreements		
Real Estate Sales		
Miscellaneous		
TOTAL ESTIMATED SOURCES OF FUNDS		$2,286

---

[1] Depending upon the cost estimate used, an additional $108 million of funds is sometimes cited, all allocated to "other" sources. The discrepancy depends on the definition of capital costs. The discrepancy has no impact on the tax incidence analysis, since all "other" sources have only nonlocal impacts.

Sources: McDonald & Grefe, Inc., "The Impacts of BART Capital and Operating Expenditures," A Technical Memorandum prepared for the BART Impact Program, Metropolitan Transportation Commission, June 1977; BART Accounting Department, Schedule of Department Requirements General Obligation Bonds, Schedule of Department Requirements Series "A", and BART Sales Tax Revenue Bonds: Recapitulation (working paper).

2. The Burden of BART Capital Financing

This section evaluates the burden of BART's capital financing. The financing plan illustrates the sources of local financing. Virtually the only specifically local sources are property tax and sales and use tax.[1]

In BART's original financial planning, it was assumed that property owners and businesses would benefit from enhanced transportation service, thus making the basic property tax financing an equitable means. The remainder of the financing would come from tolls for the Transbay Tube – equitable in terms of reduced congestion expected by motorists on the transbay crossing – and fare revenues, which were to pay for the rolling stock and all operating expenses. Thus, the burden described in this section does not reflect the original intention of BART's financial advisors, but rather the reality of the financing plan as it evolved.

a. Property Tax

The primary financing source for BART's construction was a tax on the values of property of Alameda, Contra Costa and San Francisco Counties.[2]

One possible impact of BART which would have increased the property tax base of the No-BART Alternative was the removal of property from the tax rolls through purchase by BART. The total value of BART's property acquisition was approximately $91 million. While this may have had a significant impact on the tax base of some of the smaller jurisdictions, it represents well under one percent of the District's tax base. It was deemed insignificant in this analysis.[3]

Who will have paid the property tax by the time the bonds are retired? The answer lies in the percentage of District land in residential and business use and the amount of the tax bill landlords or businesses can pass on to others. As part of this study, extensive research was undertaken to identify realistic assumptions concerning the shifting of tax burdens.[1] The assumptions are summarized in Table III-5. The findings in this report apply these assumptions to the cost of financing BART.

---

[1] If the NBA financing plan had reflected capital costs funded by other sources – whether the object of those costs had been transit improvements or other improvements – these findings would have included other revenue sources.

[2] This analysis does not consider the amount of property tax levied to support administrative costs during the construction years, although that was minimal (never more than five mills per $100 of assessed value).

[3] Among the reasons espoused for rapid transit in BART's early planning and engineering phases was that continued freeway construction had taken large amounts of private property off the tax rolls and that BART would require less land than freeway facilities to carry the same volume of traffic. San Francisco's moratorium on freeway construction and the financial and environmental problems encountered by highway planners may have reduced the significance of this justification, since highways would probably have claimed little land with or without BART over the past 15 years.

1) Burden Borne by Households

Despite early policy arguments in favor of BART as a boon to the economic welfare of the region, the financing plan was not one which would tax primarily the business and commerce which it was expected to benefit. The majority of the property tax will be paid by households, either directly or as a result of businesses passing BART's property taxes on as higher prices.

As Table III-6 indicates, over the life of the bonds, approximately 64 percent of the property tax will be paid by households.

If the land use patterns of the Bay Area shift over the next 20 years, and the proportion of the total District's assessed value which represents residential land use increases, the percentage of BART's cost borne by households will also increase.

Insofar as homeowners who itemize their tax returns can deduct their property taxes, the personal tax burden of the property tax to the homeowner, relative to the renter, can be less, depending on personal income and tax bracket. The difficulty in establishing a meaningful prototypical household for which the reduced burden of homeownership could be illustrated precluded the tax incidence analysis from distinguishing between homeowners and renters in terms of burden.

On a county-by-county basis, the relative proportion borne by households varies slightly. The taxpayers of Contra Costa and Alameda Counties, with their heavier concentrations of industry, bear slightly less of the property tax than the District total, approximately 60 percent.

The distribution of the tax burden in San Francisco is quite different because of the nature of the business activity in the City. Since a larger proportion of the business and commerce of the City is population-serving in nature – professional services and retail – a greater proportion of the tax borne by business is passed on to the residents than in Alameda and Contra Costa, with their basic industries (5).

While this section deals with who would pay the total burden of the bond financing, to provide an indication of the relative annual burden, the annual BART debt service requirements in 1975-1976 equaled only 3.9 percent of the total property tax revenues in Alameda County, 3.7 percent in Contra Costa County and 4.3 percent in San Francisco.

---

1. For detailed description of the shifting assumptions, and justification of those assumptions, see (5). Appendix A of the Technical Memorandum summarizes the burden-shifting assumptions of the property and sales taxes.

Table III-5

ASSUMPTIONS ON THE SHIFTING OF BURDEN FOR TAXATION OF PROPERTY AND IMPROVEMENTS

Property	Initial Incidence Sector	Percent of Tax Burden
Owner-Occupied Residential	Homeowner	95%
	Business	5%
Renter-Occupied Residential	Renter	95%
	Business	5%
Commercial	Business	25%
	Consumer	75%
Industrial	Business	100%
Agricultural	Business	100%

Source: McDonald & Grefe, Inc.

Table III-6

BART PROPERTY TAX INCIDENCE FOR CAPITAL DEBT RETIREMENT DISTRICT TOTAL 1964-1999

Incidence Sector	Total (in thousands)	Percent of Total	
Total Households			64.3%
Homeowners	$ 466,269.86	30.5%	
Renters	192,622.96	12.6%	
Homeowners or renters (not separately distinguishable)[1]	324,095.77	21.2%	
Total Business			24.8%
Population-Serving Industry	143,702.84	9.4%	
Basic Industry	235,428.06	15.4%	
Property Tax Relief Paid by California State General Fund	168,162.90	11.0%	11.0%
Unallocated[2]	– 1,528.75	– 0.1%	– 0.1%
TOTAL	$1,528,753.66	100.0%	100.0%

---

1. Significant amounts of property could not be classified as being occupied by homeowners or renters due to discrepancies in homeowner exemption data. The distinction is not crucial since the same assumptions about shifting of tax burden were used for both groups.

2. Unallocated represents taxes levied but not collected.

Source: McDonald & Grefe, Inc.

2) Geographic Distribution of the Tax Burden

The total property tax burden allocated to each of the BART Counties over the life of the bonds is projected in Table III-7.

Table III-7

PROPERTY TAX BURDEN BY COUNTY
BART CAPITAL COSTS, 1964-1999

County	% of Burden
Alameda	41.5%
Contra Costa	25.8
San Francisco	32.7
TOTAL	100.0%

Source: McDonald & Grefe, Inc.

b. Sales and Use Tax

In 1969, the State Legislature authorized a one-half-percent tax on retail sales to finance $150 million worth of BART rolling stock. The funding requirement of this tax will total $188 million over the life of the bonds, including interest costs.

Determination of the incidence was governed by the assumptions on sales tax incidence summarized in Table III-8.[1] The burden of the capital costs funded by the sales tax is summarized in Table III-9. It was assumed that the pattern of taxable sales existing in fiscal year 1976, i.e., the percentage of retail sales purchased by households or businesses in each of the three counties, was consistent from 1969 to 1976. In order to derive the volume of burden exported from the region, it was necessary to estimate the proportion of total taxable retail sales made to tourists or to businesses located outside the BART counties. Sales to tourists and non-residents were assumed to equal 10% of total taxable sales based, in part, on tourist expenditure pattern data developed by the San Francisco Convention and Visitors Bureau. Taxable sales to business were estimated on the basis of retail margin from each industry sector and from households, as shown in the dollar flow table of the input-output model (5, Appendix A, III). Sales to business were estimated to account for 10.8 percent of total taxable sales. The remaining 79.2 percent was assumed to be made to households in the BARTD counties.

---

[1] For a detailed discussion of the shifting assumptions, see (5).

Table III-8

ASSUMPTIONS ON FINAL INCIDENCE OF TAX BURDEN FOR SALES AND USE TAX[1]

Sector Making the Taxable Purchase	Purchase Type	Sector Finally Bearing the Burden of the Tax	Percent of Tax Allocated to Final Incidence Sector
Export-Base Industry	--	Export-Base Industry	100%
Population-Serving Industry	--	Population-Serving Industry	10%
		Households	90%
State and Local Governments	--	Households	52%
		Industry	48%
Households: Nonborder Sales[2]	Convenience goods	Households	100%
	Shopping goods	Households	80%
		Population-Serving Industry	20%
	"Other" goods	Households	90%
		Population-Serving Industry	10%
Households: Border Sales[2]	Convenience goods	Households	100%
	Shopping goods	Households	70%
		Population-Serving Industry	30%
	"Other" goods	Households	80%
		Population-Serving Industry	20%
Non-BART District Residents	--	Non-BART District Residents	100%

---

1. The tax incidence model for this project will permit any alternative set of assumptions to be used.

2. "Border sales" refer to taxable retail sales in areas of the BART District that adjoin non-BART counties where the incremental sales tax rate was not applied and, thus, to which "border area" consumers might be attracted.

Source: McDonald & Grefe, Inc.

Table III-9

FINAL INCIDENCE OF BART CAPITAL COSTS FUNDED BY SALES TAX
BY COUNTY AND DISTRICT
(in Thousands of Current Dollars)
1970-1976

	Alameda	Contra Costa	San Francisco	Total	% of Total
Household	$57,152	$29,516	$45,684	$132,252	70.4%
Business	15,604	8,272	12,972	36,848	19.6%
Export	8,084	4,136	6,580	18,800	10.0%
TOTAL	$80,840	$41,924	$65,236	$188,000	100.0%

Source: McDonald & Grefe, Inc.

These assumptions may need to be changed based upon the findings of the Land Use and Urban Development Project which devoted considerable effort to an analysis of retail sales patterns.

One quarter of one percent of the sales tax is dedicated to transit projects in that county as a result of the Transportation Development Act (TDA or SB325). This tax is a surrogate for the amount raised by applying the retail sales tax to gasoline. Since the two scenarios — BART and the NBA — assume the same amount of these monies would be spent on transit in the region, and the rate of taxation would not change in the absence of BART, there is no BART impact from the taxation associated with TDA funds.

c. Bridge Tolls

Although bridge tolls supported the Toll Bridge Authority's revenue bonds to build BART's Transbay Tube, the NBA scenario (12) does not assume that bridge tolls would have decreased. If bridge tolls would not have decreased nor increased in the absence of BART, there was no change or impact to the tax burden within the region because of BART's use of this financing source.

d. Highway User Taxes

Highway user taxes support a substantial portion of the highway network within the region. Since the NBA involved no highway improvements other than those which occurred with BART, the regional draw on highway user tax funds did not change, nor did the rate of taxation. Therefore, there was no impact on the tax burden from highway user tax financing.

e. General Revenue Funds

General revenue funds provide the primary support for local government expenditures, including any local improvements or projects which might have occurred in the vicinity of local transit stations. Street improvements, parking lot improvements, parks and other physical improvements to communities through which rapid transit operates would probably have been funded from local general revenue funds. General revenue funds are taken from the general fund of each community, and are supported by the general property tax. For purposes of the research project, however, none of these BART-induced improvements was identified by the Public Policy Project as adding to local public expenditures (2). If they had been, an indirect BART impact would have been the allocation of general revenue funds to BART-related improvements, rather than other government programs. Since it is unlikely that the general property tax rate would have increased to fund these improvements, the financing impact would have been in terms of decreased service levels for other programs. Without an increase in the property tax rate or an identification of projects on which there were transfers of funds, however, there is no BART impact on general revenue funding.

f. Total Burden

The total burden of BART's capital costs, considering the incidence of both property and sales taxes which have or will have funded BART's construction, is summarized in Table III-10. The local cost of BART, including interest, will be $1.7 billion. Sixty-five percent of this cost will be borne by households through property taxes, rent increments reflecting the property tax or consumer purchases of taxable retail items. Twenty-four percent will be borne by business and almost 11 percent will be exported to tourists, businesses outside the region purchasing within the region, and transfers from the State General Fund for property tax exemptions.

Table III-10

TOTAL BURDEN OF BART'S CAPITAL COSTS
THE INCIDENCE OF PROPERTY AND SALES TAXES
1964-1999
(in Thousands of Current Dollars)

	Property Tax	Sales Tax	Total	% of Total
Households	$ 982,989	$132,252	$1,115,241	65.0%
Businesses	379,131	36,848	415,979	24.2
Export	168,163	18,800	186,963	10.9
Unallocated	- 1,529		- 1,529	- 0.1
TOTAL	$1,528,754	$188,000	$1,716,754	100.0%

Source: McDonald & Grefe, Inc.

In determining this total burden, two assumptions were made which may be changed by the findings of the Land Use and Urban Development Project. Pending completion of that project, the BART Impact Program decided to assume that the relative distribution of land within each county dedicated to residential or business uses would remain constant between 1976 and 1999. Further, the rate of inflation or appreciation of assessed value within each land use was assumed to be constant during the same period. Together, these assumptions limit the projection of property tax incidence to the characteristics of the region in 1976. There is little question, however, that this profile will change over the next 20 years, and as the Land Use and Urban Development Project identifies the likely changes, the relative proportion of the burden shared by households and businesses will shift.[1]

3. Equity Considerations of BART's Capital Financing

The impact of BART's financing on the income of a range of households – with different incomes, family sizes and consumption patterns – was measured to provide an indicator of the progressivity or regressivity of the financing and the relative magnitude of the burden. A representative range of household sizes, incomes and age groups was selected for this purpose (5).

The tax incidence for BART capital expenses was analyzed as a percentage of household income. The burden for various types of households is shown in Table III-11 for BART capital costs.

An important criterion in evaluating alternative financing plans is the equity of a tax, or its taxing of individuals or households in direct proportion to their ability to pay. According to this criterion, a more equitable tax would represent at least the same proportion of the income of every household. Public policy tends to favor progressive taxing policies, which tax the more affluent at a higher rate than the less affluent.

A tax in which the same rate is applied to all households, regardless of circumstances, will tend to be regressive, or unfavorable to those with the least ability to pay. This regressive characteristic is the result of both a lower income and the need to spend a greater proportion of that income on essential consumption, such as housing, food and clothing – with less disposable income left for incremental tax payments.

The typical households are arranged in Table III-11 in order of increasing household income. Here, the regressive nature of BART financing can be seen most clearly. The financing of capital costs of BART shows a pattern of decreasing burden as a

---

[1] It was the decision of the BART Impact Program that independent projections of land use for the Economics and Finance Project or reliance on the regional land use model would be premature, while the Land Use and Urban Development Project would be able to commit greater resources to identifying these effects.

Table III-11

ANNUAL TAX BURDEN OF TYPICAL HOUSEHOLDS FOR BART CAPITAL EXPENDITURES, 1976

Income	Household Description	Payment of Burden			Tax Burden As Percent of Income
		Property Tax	Sales Tax	Total Tax Burden	
$ 2,362	Family of 4, poverty-level living standard, female head of household	$10.93	$ 4.70	$15.63	0.66%
$ 4,489	Individual, lower living standard, over 65, retired	$22.54	$ 9.86	$32.90	0.72%
$ 6,851	Couple, low-moderate living standard, head over 65	$24.18	$14.09	$38.27	0.56%
$ 8,859	Family of 3, low-moderate living standard	$34.14	$16.44	$50.58	0.57%
$10,041	Individual, low-moderate living standard	$15.98	$15.97	$31.95	0.32%
$10,277	Couple, low-moderate living standard	$34.14	$16.44	$50.58	0.49%
$14,411	Family of 3, moderate living standard	$34.14	$16.44	$50.58	0.35%
$15,711	Couple, moderate living standard	$35.38	$21.13	$56.51	0.36%
$18,191	Family of 6, moderate living standard	$39.90	$26.38	$66.28	0.36%
$21,735	Family of 4, high living standard	$40.99	$29.12	$70.11	0.32%
$45,715	Family of 4, affluent living standard	$71.86	$39.45	$111.31	0.24%

Source: McDonald & Grefe, Inc.

percent of household income, as household income increases. The greatest relative burden of financing capital costs, in this analysis, falls on the group represented by an individual with low-moderate living standard. Similarly, a high relative burden is borne by a poverty-level family of four. The affluent family of four has the lowest relative tax burden.

Similarly, in Table III-12, the typical households are presented in order of increasing per capita income. Using this measure, the tax burden appears somewhat less regressive. However, the five typical households with the lowest per capita incomes have a considerably higher tax burden.

The tax burden defined here should be recognized as a comparative measure, not an absolute one. Every household, depending on its housing and consumption patterns, will bear a different burden. This description of the burden by "typical" household characteristics is a more meaningful measure of tax burden than merely the statistical value of total per capita financing cost in the three counties (which, in 1976, is $29.25), since the burden on these 11 representative households addresses the equity issues.

Although this finding indicates the means of financing BART is regressive, this is neither unusual nor unexpected. Most public projects are financed by regressive taxes.

C. The Impact of BART's Bond Issue on Regional Public Financing

The magnitude of the general obligation bond issue which financed the costs of constructing BART's basic system was virtually unprecedented. At the time, it represented the largest single local bond issue in history. The $792 million debt represented a full 15 percent of the assessed valuation of the property in the three BART counties, the legal limit for the debt of a special district. In fact, with one ballot, the voters of the counties were more than doubling their indebtedness.

A bond issue of this magnitude changes the financial condition of a region. It would not seem unlikely that the bond issue could affect the creditworthiness of the region or the interest rate on other public debt. It might also cause local government, for fear of having new bonded indebtedness proposals rejected by the voters in the shadow of the region's BART debt, seek financing mechanisms which did not require public approval or defer new capital improvements altogether. This section addresses each of these possibilities. For further discussion, see (1).

Table III-12

TYPICAL HOUSEHOLD TAX INCIDENCE BY PER CAPITA INCOME CATEGORY FOR BART CAPITAL EXPENSES

Per Capita Income	Household Description	Per Capita Tax Burden for Capital Expenses as % of Household Income
$ 591	Family of 4, poverty-level living standard, female head of household	0.66%
$ 2,953	Family of 3, low-moderate living standard	0.57%
$ 3,032	Family of 6, moderate living standard	0.36%
$ 3,426	Couple, low-moderate living standard, head over 65	0.56%
$ 4,482	Individual, lower living standard, over 65, retired	0.72%
$ 4,804	Family of 3, moderate living standard	0.35%
$ 5,139	Couple, low-moderate living standard	0.49%
$ 5,434	Family of 4, high living standard	0.32%
$ 7,856	Couple, moderate living standard	0.36%
$10,041	Individual, low-moderate living standard	0.32%
$11,429	Family of 4, affluent living standard	0.24%

Source: McDonald & Grefe, Inc.

1. The Impact of BART's Bond Issue on the Cost of Public Borrowing

BART debt, which represented such a substantial increase in the local tax burden, could have been perceived as increasing the risk of tax delinquencies. Increased risk is accommodated in the marketplace by an increased cost of borrowing. Therefore, BART's debt could have had an impact on the cost of other public borrowing.

On the other hand, BART debt could have been perceived as an investment in the regional infrastructure which would encourage future growth, reinforcing the ability of the region to support further general obligation debt. This second effect would be contrary to the first.

Both of these effects or others may have been perceived by bond buyers. In order to isolate the effect of BART's bond issue on the public financing market, it was necessary to identify bond buyers' perceptions of each of these effects. In the marketplace, these perceptions are evidenced by price.

The approach to isolating these differing influences was to establish a statistical base with which to confront key informants to determine their interpretation of the bond buyers' perceptions. The municipal bond financing industry, in which the judgment of a few individuals will determine the creditworthiness of a bond issue and influence its price, provided the key informants for evaluating this potential impact.

a. Statistical Data

The interviewing process was based on confronting key informants with reference data. The data collected and displayed for discussion included the following:

- The average interest rate bid for every reported competitive bond sale in the three BART District counties (and two Bay Area control counties) over the 1962-1972 period. These data were limited to general obligation and other tax-supported bond issues.
- The BART debt and total debt ratios for each issue. Debt ratios are expressed as a percentage of assessed valuation subject to tax for bond payment. Currently, in California, assessed values average about 25 percent of the fair market value of property subject to taxation, but this ratio was changing during the period under study.

- State and national money and municipal market indicators including a California bond index, the Bond Buyer's 20-bond municipal index, and the yield on three-month Treasury bills.

- Reoffering yields for various BART bonds of the 1992 maturity. These are the yields based on the price asked in the secondary market.

The data were arrayed in simple exhibits which summarized annual averages of interest costs and debt ratios. These arrays showed that while BART had a major impact on debt ratios, the interest bids on BART county issues were very similar to non-BART county issues. The interviews were planned to stimulate specific recall of what actually happened to BART county borrowing costs from 1962 to 1972.

b. Key Informant Interview Program

The seven key informants interviewed are respected professionals involved daily (and during the study period) in deciding, or advising on, the cost of public borrowing. One headed the consulting department of Blythe & Company's San Francisco office, and had consulted with the staff of Stone & Youngberg, the municipal financing consultants who prepared the evaluation of the original financing plan for BART. Another was director of the Bank of America's Municipal Bond Research Department during the study period. A third was Vice President of Standard & Poor's Corporation, active in analyzing municipal issues for rating purposes, including several BART and many other Bay Area issues.

Three senior decisionmakers in the underwriting and trading side of the municipal bond industry were also interviewed. These individuals each directed their firms' principal West Coast trading desks, for Blyth, Eastman, Dillon & Company, United California Bank and Merrill Lynch.

Finally, in order to gain the professional buyers' views of the impact of BART's financing, the former manager of the municipal bond portfolio of a major insurance company which holds over $20 million in BART bonds was interviewed.

It is important to recognize that the municipal bond financing industry consists of a small group of influential people who have the power to determine the price of bonds through rating, underwriting or purchasing. Because of the influence of key individuals, a large statistical sample is not necessary.

Statistical analysis of interest rates supported the possibility that BART debt increased the interest on general obligation debt reissues and thus increased interest rates on other general obligation bonds in the Bay Area. It rejected the hypothesis that BART, because it represented a substantial investment in infrastructure, increased prospects for improved economic development and thus lowered other debt costs.

c. Findings

Bond prices are eventually determined at the trading desk. The interviewing program brought the question of BART's impact on other bond issues to the individuals who had been in a position to set interest rates for other bond issues during the period 1962-1972. None of those interviewed conveyed the opinion that buyers were either enthused or concerned about BART or high-debt ratios, when considering alternative investments.

The magnitude of BART's proposed debt, and its impact on the existing debt ratio of the region, were apparent from the bond offering prospectus. Nonetheless, none of the major rating agencies which determine the creditworthiness — and implied risk — of local agencies downgraded any of the agencies within BART's district. In fact, they rapidly upgraded suburban ratings during BART's construction period, implying that, despite the BART claim on the property of the District, the region was a better risk. None of the interviews yielded the opinion that BART had an impact on the interest costs of other public issues.

While debt ratios normally rise no more than a few percent at a time, BART's bond issues increased the debt ratio over twofold. Despite this dramatic increase, neither major rating agency lowered any Bay Area credit, nor was there a perceptible increase in the cost of borrowing.

2. The Impact of BART's Bond Issue on the Financing of Other Public Projects

Although 61.2 percent of the votes cast in November 1972 were in favor of BART's financing, the size of the debt could have satiated the public's willingness for additional bonded indebtedness. Most proposals to incur general obligation debt supported by the property tax require two-thirds approval from the votes cast.[1] As a result, general obligation bonds are not lightly proposed in California. Because of this difficulty, a number of financing techniques which avoid the requirement of popular approval have been developed, including various forms of lease-purchase techniques. Voter response, then, is one possible indicator of voter sentiment about bond issues, but it has to be considered along with the policy decisions on whether or not to subject a potential project to a vote.

---

[1] The BARTD enabling legislation specifically permitted BART to obtain financing with 60% of the votes of the total district.

With BART's construction, voter sentiment was analyzed statistically to see if there were any apparent shifts in sentiment as BART debt and taxes increased in size and visibility. Then, independently, a program of interviews was designed and carried out, both as a check on the statistical conclusions and to examine whether awareness of BART caused any increase in the use of nonvoted bonds.

This study involved inquiries directly into the folklore of public financing. It examined whether or not a large bond commitment, such as BART, would turn voters against other debt proposals for other purposes. It explored whether the existence of conspicuous debt, such as BART's, causes policymakers to pursue less conspicuous means for financing other projects or to drop them altogether.

a. Statistical Analysis

The statistical analysis was conducted on bond elections, the value of the issues on the ballot, and the election results for all county, school district and special district bond elections conducted by each of the BART counties, and two non-BART counties, Marin County and San Mateo County (as control areas), from 1962 to 1972. The data included the 277 of 360 bond elections during that period, the remainder representing city elections.

Regression analysis indicated virtually no relationship between favorable votes on bond issues and the dollar value of bond issues, given existing bond indebtedness. This tended to refute the notion that voters' willingness to pass general obligation issues is related to their local tax burden. Regardless of the partitioning of data, relative to BART counties and non-BART counties, the result is the same. Local tax burden did not statistically explain changes in the behavior index. When the analysis was run on each county individually, Marin County does have a statistically significant relationship between voter behavior and changes in the local tax burden. It must be noted, however, that Marin County has been the focus of citizen interest in limiting further growth and any capital improvement project may be opposed on those grounds, rather than the local bonded indebtedness.

The conclusion from the statistical analysis is that voter sentiment is generally unrelated to local tax burden, *per se*. To the extent the local tax burden may be associated by voters with unwanted growth, or distrust of government as a resource allocator, one may support a cause and effect relationship. But the 1962 to 1972 data do not reflect widespread concern on these points.

There remains the question of whether or not higher taxation deters decisionmakers from putting important projects to a vote. Nonvoted debt was used as a proxy for reluctance to put projects to a vote, and an attempt was made to find a relationship between nonvoted debt, present tax burden, and voter sentiment.

For this approach to be meaningful, substitutability must exist. That is, decisionmakers must have discretion over whether to fund a project by bringing a proposal to the voters or to fund a project with nonvoted debt. That option was not, then, generally available for school, water, sewer and park bonds. As a result, the data base is too small for meaningful statistical analysis. This hypothesis could only be confirmed or rejected, if at all, on the basis of an interviewing program of key informants.

b. Interview Program

The purposes of the interview process were to check independently the statistical work and to explore particularly the policy considerations which underlay the issuance of nonvoted bonds. There are primarily four types of nonvoted bonds: joint-power bonds, nonprofit corporation bonds, redevelopment bonds and charter revenue bonds. The joint-power bonds are issued on behalf of two or more public agencies for public buildings and closely related facilities. These represent lease-rental revenue bonds, that is, secured solely by rentals, payable by the public agencies which occupy the facilities under lease from the joint-powers authority. The nonprofit corporation bonds are also lease-rental revenue bonds.

The statistical and interview work was directed solely at the forms of lease-rental revenue bonds. These forms of nonvoted debt are employed to finance a project of communitywide interest and benefit. They are issued most commonly by cities and counties, two of the three legal entities which are constitutionally restricted from incurring long-term debt without a two-thirds approving vote.[1]

Thirty-three nonvoted bond issues were sold by local agencies in the five-county Bay Area during the study period. These appear to include lease-rental revenue bonds plus a number of other kinds of revenue bonds. Of those issues, 16 were issued by agencies within the BART district. The interview process used this tabulation of nonvoted bond issues as a basis for gaining a reaction to the hypothesis that these debt instruments were used because of the impact of BART's bond issue on public willingness to fund other public projects.

Six local decisionmakers were interviewed, two in Alameda County, two in Contra Costa County, and one each in San Francisco and Santa Clara Counties. The interviewees represented public

---

1. School districts are also now permitted to issue these lease-rental revenue bonds upon a majority vote, but were unable to do so in the period of this study.

works directors, city managers, mayors or councilmen, and financial advisors. The results of the interviewing were totally consistent with each other, and were confirmed by a public relations consultant expert in bond approval campaigns, and the principal investigator, a professional advisor to public agencies on financing options, including evaluating bond election prospects and the design and marketing of both voted and nonvoted bond issues.

In each case in which nonvoted bond issues were recommended and passed, the option of voted bonds was weighed and rejected. But in every instance, the interviewing program revealed there had been some compelling reason, other than BART, which clearly dictated the financing choice.

c. The BART Impact on Financing Options

BART debt itself, and BART-related tolls and taxes, are clearly visible. If an excuse were sought to explain the failure of a bond election or even deferring putting a project to a vote, BART debt would be an obvious candidate. Nonetheless, none of the interviewees used BART debt as an explanation. In every case, local decisions were governed by local policy, not by the impact of BART's funding.

In the case of bond issues which fail to gain two-thirds majority approval, the reason cited for their failure included confusing ballot proposals, inadequate campaign organization, lack of public support in the cities, general resistance to public buildings, voter dissatisfaction with the schools or voter resentment of state legislation which required the capital improvements to be funded. Undoubtedly, at least a few voters reflect on BART's debt or perhaps BART's bad press and its reinforcement of their lack of confidence in government. However, the effect of BART's debt was sufficiently obscure that it could not be measured statistically and was not volunteered as the cause of failure by any person interviewed who had been involved in financial planning.

Even when the question was posed directly, "Is it possible that BART or BART debt somehow influenced the outcome or decision?", the answer was an unwavering "No."

While nonvoted bonds have been used for numerous capital improvement projects, particularly since 1966, the reason is wholly unrelated to BART. In 1966, nonprofit corporation bonds were first marketed in public competitive bids. As the bonds gained stature in the marketplace, they became more price competitive with general obligation bond financing. When state laws were further amended in 1970 to mandate competitive bidding, nonprofit corporation bonds also gained sudden respectability among many policymakers. The trend to increased use of nonprofit corporation bonds is statewide, not a Bay Area development.

There were no indications that BART or BART debt has resulted in dropping or delaying a project.

The unqualified and consistent conclusion by each person confirms statistical analysis, "Voter response to policy decisions and public projects were not perceptibly affected by BART, BART debt or BART publicity. Local projects stand or fall for local reasons." This conclusion is offered with one qualification. The analysis did not explore the reasons for voter or policymaker response to transportation projects that would require or permit linkage to the BART system or consolidation with the BART District.

3. The Implications for Public Transit Financing

The implications of these findings for public transit financing are that the portion of the local share of transit financed by general obligation indebtedness will have little negative effect on the cost of borrowing or the willingness of local government to borrow for other public projects. One caveat is highly relevant: The BART experience occurred prior to the highly publicized concern over public fiscal soundness triggered by the City of New York's default on its bonds.

IV. THE ECONOMIC AND FINANCIAL IMPACTS OF OPERATING BART

There are two distinct kinds of expenditure associated with implementing a rapid transit system. First, and frequently the more immediately visible, is the capital investment in rights of way, track, facilities and rolling stock. The impacts of those investments in rapid transit normally occur within the first 10 years after the decision to build is made. It consists of an infusion of capital into the regional economy, but the only residual economic effects may be those of employment opportunity from workers trained during the construction period, or regional production capabilities developed specifically for transit improvements.

The other major kind of expenditure associated with rapid transit is the continuing expenditure for operations. In many cases, these expenditures are treated as a secondary consideration when the initial decision to fund rapid transit occurs. Yet a greater percentage of these expenditures must be met from local dollars than the capital investment under current federal funding policies, and these continuing expenditures have a longer-term effect on the regional economy. They also represent long-term burdens of a proposed system. Finally, in the long run, these expenditures frequently will argue for capital intensive systems, which traditionally have substituted initial capital investment for a system which will meet travel demand volumes with fewer operating personnel.

An increasing concern of local decisionmakers is also the substantial continuing financing burden associated with operating costs. The impact of BART's financing on regional transit, particularly in terms of the tax incidence and tax burden, is described.

A. The Impacts of BART Operations on Regional Sales and Income

In this section, the economic impacts of transit's continuing operating expenditures are evaluated. These impacts include the impacts on regional sales and income (the so-called gross regional product); the direct, indirect and induced employment impacts; the impact on minority employment opportunity from introducing a major new public employer into the region; and the effects of operating expenditures on regional household income, both nonminority and minority.

1. The Cost of Operating Transit (The Direct Expenditures)

For purposes of evaluating the operating costs for rapid transit, 1976 service levels for BART were assumed to represent full service levels (12). The costs associated with that full service level, classified by economic sector, were used to test the impacts of operating expenditures.

The impact of BART operations on the economy, however, is the difference between the level of BART operating expenditures and the level of expenditures which other transit agencies would have incurred to meet transit requirements in the absence of BART. Thus, it was also necessary to classify the operating costs for the agencies who were assumed to be the operators of the No-BART Alternative (NBA) — AC Transit, San Francisco MUNI and Greyhound. The net difference (or the BART impact on operating expenditures) is reflected in Table IV-1. The contents of this table represent the costs used to evaluate BART's operating impacts throughout this section.

2. Regional Output Effects

BART's impact on the total sales and income inside the region from operating expenditures alone is estimated at $149 million per year. This increase in the gross regional product reflects the impact of the additional $46.7 million that BART pays annually for transit operating costs than the NBA would cost. It also includes the indirect and induced sales and income which must be generated to support BART operations. The direct expenditures are the actual difference in operating budgets between BART and the NBA.[1] The indirect sales and income generated include purchases of intermediate goods and services to support the direct requirements, for instance, a maintenance contract which is a direct expenditure may also involve an intermediate purchase of labor, petroleum products or tools. The induced sales and income represent the impact of purchases made by consumers with the income they earned from direct or indirect expenditures. All of the impacts represent only those sales and income effects which would be experienced inside the region. If goods or services are purchased outside the region, their value does not appear in this total.

The analysis in the present project does not address the question of whether or not the same amount of money would have been spent on other programs in the absence of BART, but the Public Policy Project (2) has not found that a substitution effect would have occurred. This is not surprising since BART represents an independent single purpose agency; its financial capacity would not easily be acquired by any other public agency.

The increase of $46.7 million in direct expenditures beyond what would have been spent under the NBA scenario generates a total of $149.0 million, in additional regionally-produced goods and services.[2]

Table IV-2 illustrates the economic sectors directly and indirectly affected by BART's operating impact.

---

[1] The NBA is described in greater detail in Section II.

[2] BART's budget alone, without considering the reduction in budget for the other transit operators, would have a direct impact of $59.8 million and a total sales and income requirement of $189.6 million.

Table IV-1

BART IMPACT ON OPERATING EXPENDITURES (In Millions of 1976 Dollars)

I-O Model Sector	Operating Expenditure Impact (the difference in expenditures for each agency, comparing the BART and NBA scenarios			
	BARTD	SF MUNI	AC TRANSIT	GREYHOUND
1. AGRICULTURE AND MINING	0.000	0.000	0.000	0.000
2. NEW RESIDENTIAL CONSTRUCTION	0.000	0.000	0.000	0.000
3. NEW BUILDING CONSTRUCTION	0.000	0.000	0.000	0.000
4. NEW UTILITIES CONSTRUCTION	0.000	0.000	0.000	0.000
5. NEW HIGHWAY CONSTRUCTION	0.000	0.000	0.000	0.000
6. NEW CONSTRUCTION ALL OTHER	0.000	0.000	0.000	0.000
7. MAINTENANCE AND REPAIR CONSTRU	1.940	- .049	- .012	- .032
8. ORDINANCE	0.000	0.000	0.000	0.000
9. FOOD PROCESSING	0.000	0.000	0.000	0.000
10. TEXTILE PRODUCTS	0.000	- .010	- .001	- .003
11. LUMBER AND WOOD PRODUCTS	0.000	0.000	0.000	0.000
12. FURNITURE PRODUCTS	0.000	0.000	0.000	0.000
13. PAPER AND ALLIED PRODUCTS	.047	- .003	- .001	- .001
14. PRINTING AND PUBLISHING	.048	- .038	- .007	- .018
15. CHEMICALS AND PLASTIC PRODUCTS	0.000	0.000	0.000	0.000
16. PETROLEUM REFINING	.040	- .147	- .041	- .109
17. RUBBER AND LEATHER PRODUCTS	0.000	- .036	- .007	- .020
18. STONE AND CLAY PRODUCTS	0.000	0.000	0.000	0.000
19. PRIMARY IRON AND STEEL	.005	- .005	0.000	0.000
20. PRIMARY NON-FERROUS METALS	0.000	0.000	0.000	0.000
21. METAL CONTAINERS	0.000	0.000	0.000	0.000
22. FABRICATED STUCTURAL METAL PRO	.043	- .003	.000	0.000
23. MACHINE SHOP PRODUCTS	.022	- .008	- .002	0.000
24. OTHER FABRICATED METAL PRODUCT	.026	- .004	- .001	- .002
25. CONST. AND MATERIALS HANDLING	0.000	0.000	0.000	0.000
26. METAL WORKING EQUIPMENT	0.000	- .005	- .001	- .002
27. GENERAL INDUSTRIAL MACHINERY	0.000	0.000	0.000	0.000
28. OFFICE AND COMPUTING MACHINERY	.038	- .001	.000	.000
29. SERVICE INDUSTRY MACHINES	0.000	0.000	0.000	0.000
30. ELECTRIAL TRANSMISSION EQUIPME	.108	- .002	0.000	0.000
31. OTHER ELECTRICLA EQUIP. NEC	.030	- .002	0.000	0.000
32. COMMUNICATION EQUIPMENT	0.000	0.000	0.000	0.000
33. ELECTRONIC COMPONENTS AND EQUI	.087	0.000	0.000	0.000
34. MOTOR VEHICLES AND EQUIPMENT	0.000	- .002	.000	- .001
35. AIRCRAFT AND PARTS	0.000	0.000	0.000	0.000
36. OTHER TRANSPORTATION EQUIP.	0.000	0.000	0.000	0.000
37. SCEINTIFIC INSTRUMENTS	0.000	0.000	0.000	0.000
38. MISCELANEOUS MANUFACTURING	0.000	- .003	.000	- .001
39. TRANSPORTATION AND WHAREHOUSIN	.002	- .003	- .001	- .002
40. COMMUNICATIONS	.312	- .004	- .001	- .002
41. ELECT. AND GAS UTILITIES	2.743	- .077	- .002	- .004
42. WHOLESALE AND RETAIL TRADE	.144	- .026	- .033	- .089
43. FINANCE AND INSURANCE	1.128	- .213	- .061	- .163
44. REAL ESTATE AND RENTAL	.151	- .004	- .001	- .003
45. PERSONAL SERVICES	.006	0.000	0.000	0.000
46. BUSSINESS SERVICES	1.700	- .072	- .017	- .045
47. AUTOMOBILE REPAIR AND AMUSEMEN	.017	- .002	.000	- .001
48. MEDIAL SERVICES AND NON-PROFIT	.522	- .036	- .011	- .030
49. GOVERMENT ENTERPRISES	.042	0.000	- .001	- .002
50. PUBLIC TRANSIT FACILITIES	2.157	0.000	0.000	0.000
51. MINORITY INCOME	6.514	-2.812	- .355	- .699
52. NON-MINORITY INCOME	32.030	-3.437	- .578	-1.796
53. INTERMEDIATE OUTLAYS	11.357	- .840	- .201	- .536
54. UNALLOCATED VALUE ADDED	5.438	- .038	- .069	- .077
55. REGIONAL IMPORTS	2.467	- .207	- .047	- .142
56. TOTAL	59.806	-7.726	-1.451	-3.880

Table IV-2

REGIONAL OUTPUT EFFECTS FROM BART OPERATING EXPENDITURES 1976
(In Millions of 1976 Dollars)

SF BAY I-O SECTOR DESCRIPTIONS	TOTAL DIRECT AND INDIRECT IMPACTS
1. AGRICULTURE AND MINING	.967
2. NEW RESIDENTIAL CONSTRUCTION	0.000
3. NEW BUILDING CONSTRUCTION	0.000
4. NEW UTILITIES CONSTRUCTION	0.000
5. NEW HIGHWAY CONSTRUCTION	0.000
6. NEW CONSTRUCTION ALL OTHER	0.000
7. MAINT. AND REPAIR CONSTRUCTION	2.453
8. ORDINANCE	.013
9. FOOD PROCESSING	4.486
10. TEXTILE PRODUCTS	.628
11. LUMBER AND WOOD PRODUCTS	0.000
12. FURNITURE PRODUCTS	.192
13. PAPER AND ALLIED PRODUCTS	.459
14. PRINTING AND PUBLISHING	.854
15. CHEMICALS AND PLASTIC PRODUCTS	.879
16. PETROLEUM REFINING	.939
17. RUBBER AND LEATHER PRODUCTS	.154
18. STONE AND CLAY PRODUCTS	.160
19. PRIMARY IRON AND STEEL	.074
20. PRIMARY NON-FERROUS METALS	.014
21. METAL CONTAINERS	.287
22. FABRICATED METAL PRODUCTS	.094
23. MACHINE SHOP PRODUCTS	.066
24. OTHER FABRICATED METAL PRODUCT	.103
25. CONST. AND MATERIALS HANDLING	.006
26. METAL WORKING EQUIPMENT	.004
27. GENERAL INDUSTRIAL MACHINERY	.028
28. OFFICE AND COMPUTING MACHINERY	.070
29. SERVICE INDUSTRY MACHINES	.026
30. ELECT. TRANSMISSION EQUIP.	.108
31. OTHER ELECTRICAL EQUIP.	.109
32. COMMUNICATION EQUIPMENT	.014
33. ELECTRONIC COMPONENTS AND EQUI	.145
34. MOTOR VEHICLES AND EQUIPMENT	1.858
35. AIRCRAFT AND PARTS	.006
36. OTHER TRANSPORTATION EQUIP.	.039
37. SCIENTIFIC INSTRUMENTS	.102
38. MISCELLANEOUS MANUFACTURING	.108
39. TRANSPORTATION AND WHAREHOUSIN	1.569
40. COMMUNICATIONS	.977
41. ELECT. AND GAS UTILITIES	4.663
42. WHOLESALE AND RETAIL TRADE	7.882
43. FINANCE AND INSURANCE	4.424
44. REAL ESTATE AND RENTAL	4.149
45. PERSONAL SERVICES	1.431
46. BUSINESS SERVICES	3.076
47. AUTOMOBILE REPAIR AND AMUSEMEN	1.873
48. MEDICAL AND NON-PROFIT SERVICE	3.722
49. GOVERNMENT ENTERPRISES	1.142
50. * OTHER PUBLIC TRANSIT	.015
51. MINORITY INCOME	11.198
52. NON-MINORITY INCOME	40.663
53. TOTAL	102.229

Many of the sectors significantly affected would be expected from any rapid transit agency's budget: maintenance and repair, communications, electric utilities, finance and insurance, and business services. These direct effects would be evident from Table IV-1, which classified transit agency's expenditures.

A more interesting finding is the type of sector which experiences substantial indirect or induced effects. The indirect impacts bear the influence of large multipliers of that initial operating dollar for transportation and warehousing, finance and insurance, real estate, personal services, medical and nonprofit services, and government enterprises. Other sectors which experience an impact, probably from consumer spending from increases in income, include food processing, motor vehicles and equipment, wholesale and retail trade, automobile repair and amusement.

The multipliers for expenditures on operating costs for rapid transit versus bus transit in the Bay Area are illustrated in Table IV-3. These multipliers indicate the total economic activity generated within the regional economy for each dollar spent by each transit agency for operations. If BART is compared with AC Transit, the only purely bus alternative provided by a public agency among those illustrated, it is apparent that the impact of each dollar spent on bus transit is slightly greater than the activity generated by each dollar spent on BART's operations, probably because of the greater labor intensity of bus operations. The difference is very slight, and does not hold true for the multiple modes of MUNI or the private operations of Greyhound Western. While BART's multiplier is lower than the other three transit operators — possibly reflecting the purchase of more goods and services outside the region — the total amount spent is greater. The difference in the magnitude of the operating budget results in BART's economic effect being greater.

Table IV-3

SALES AND INCOME MULTIPLIERS
FOR OPERATING EXPENDITURES

BART	3.187
AC Transit	3.223
San Francisco MUNI	3.181
Greyhound Western (Local Only)	3.034

Source: McDonald & Grefe, Inc.

3. Regional Employment Effects

BART's direct employment for full service operations is assumed to be 1,865 persons for purposes of this analysis. The BART impact on direct employment represents the difference between BART's employment and the requirements of the NBA to maintain the assumed service levels. On the basis of current experience, the NBA operators would require 600 additional employees for the level of service implied by increased operating expenditures.[1] Thus, the net BART impact on direct employment is 1,265 employees. The regional employment effects of BART have been measured on this basis.

The input-output analysis established employment equivalents per million dollars of operating expenditures. These ratios for different types of agencies within the Bay Area in 1976 are illustrated in Table IV-4. These may prove helpful in establishing a reasonable range of impact estimates elsewhere. Rapid transit operations generated fewer jobs in the region, per million dollars of operating expenditures, than bus operations. But BART's larger operating budget results in a larger total employment impact.

BART's employment multipliers may reflect unusual requirements — such as maintenance requirements, unique to BART. Likewise, AC Transit is an extremely efficient regional bus system. Users of these ratios elsewhere should consider these conditions.

BART's regional employment impact from direct expenditures and the associated indirect and induced expenditures total over 3,000 permanent jobs. Table IV-5 indicates the direct and total employment requirements of BART's budget, beyond what the NBA would require.

Table IV-4

EMPLOYMENT CHARACTERISTICS
OF TRANSIT AGENCIES
1976

Transit Agency	Mode	Direct Employment per Million Dollars of Operating Expenditure (Jobs)
BART	Heavy Rail	31.18
AC Transit	Bus	45.86
San Francisco MUNI	Bus/Light Rail/Cable Car	48.31

Source: McDonald & Grefe, Inc.

---

[1] The 600-employee increment to the labor forces of AC Transit, MUNI and Greyhound may appear high, in contrast to the 15-bus capital requirement of the NBA. One hundred sixty employees would be required by Greyhound to provide local service; given the NBA operating budget estimated by MTC, the implied employment effects of MUNI and AC Transit are 373 employees and 67, respectively, to provide better utilization of current equipment.

Table IV-5

BART IMPACT ON EMPLOYMENT FROM TRANSIT OPERATING EXPENDITURES
(Person-Year Equivalents)
Fiscal Year 1976

SF BAY I-O SECTOR DESCRIPTIONS	DIRECT AND INDIRECT EMPLOYMENT IMPACTS
1. AGRICULTURE AND MINING	47.
2. NEW RESIDENTIAL CONSTRUCTION	0.
3. NEW BUILDING CONSTRUCTION	0.
4. NEW UTILITIES CONSTRUCTION	0.
5. NEW HIGHWAY CONSTRUCTION	0.
6. NEW CONSTRUCTION ALL OTHER	0.
7. MAINT. AND REPAIR CONSTRUCTION	80.
8. ORDINANCE	0.
9. FOOD PROCESSING	73.
10. TEXTILE PRODUCTS	23.
11. LUMBER AND WOOD PRODUCTS	0.
12. FURNITURE PRODUCTS	5.
13. PAPER AND ALLIED PRODUCTS	10.
14. PRINTING AND PUBLISHING	25.
15. CHEMICALS AND PLASTIC PRODUCTS	13.
16. PETROLEUM REFINING	8.
17. RUBBER AND LEATHER PRODUCTS	3.
18. STONE AND CLAY PRODUCTS	3.
19. PRIMARY IRON AND STEEL	2.
20. PRIMARY NON-FERROUS METALS	0.
21. METAL CONTAINERS	8.
22. FABRICATED METAL PRODUCTS	4.
23. MACHINE SHOP PRODUCTS	3.
24. OTHER FABRICATED METAL PRODUCT	5.
25. CONST. AND MATERIALS HANDLING	0.
26. METAL WORKING EQUIPMENT	0.
27. GENERAL INDUSTRIAL MACHINERY	2.
28. OFFICE AND COMPUTING MACHINERY	1.
29. SERVICE INDUSTRY MACHINES	1.
30. ELECT. TRANSMISSION EQUIP.	3.
31. OTHER ELECTRICAL EQUIP.	3.
32. COMMUNICATION EQUIPMENT	0.
33. ELECTRONIC COMPONENTS AND EQUI	6.
34. MOTOR VEHICLES AND EQUIPMENT	13.
35. AIRCRAFT AND PARTS	0.
36. OTHER TRANSPORTATION EQUIP.	1.
37. SCIENTIFIC INSTRUMENTS	1.
38. MISCELLANEOUS MANUFACTURING	5.
39. TRANSPORTATION AND WAREHOUSIN	44.
40. COMMUNICATIONS	25.
41. ELECT. AND GAS UTILITIES	120.
42. WHOLESALE AND RETAIL TRADE	531.
43. FINANCE AND INSURANCE	201.
44. REAL ESTATE AND RENTAL	14.
45. PERSONAL SERVICES	72.
46. BUSINESS SERVICES	121.
47. AUTOMOBILE REPAIR AND AMUSEMEN	59.
48. MEDICAL AND NON-PROFIT SERVICE	190.
49. GOVERMENT ENTERPRISES	19.
50. * OTHER PUBLIC TRANSIT	1.
51. MINORITY INCOME	0.
52. NON-MINORITY INCOME	0.
53. * BARTD OPERATIONS	1863.
54. * AC TRANSIT OPERATIONS	-67.
55. * SAN FRANCISCO MUNI	-373.
56. * GREYHOUND (LOCAL ONLY)	-160.
57. TOTAL JOBS	3017.

4. Regional Income Effects

The impacts of BART's operations on household income in the region are a direct reflection of the high level of operating costs for BART. Total personal income in the region increases an estimated $51.9 million annually, due to BART's operating expenditures. Almost 22 percent of this income went to minority households, considerably higher than the distribution of personal income generated by capital expenditures.

The reasons a greater percentage of the operating expenditures accrued ultimately to minority households is probably due to the operating work force containing a greater percentage of minority workers than the construction work force.

5. The Impact of BART Permanent Employment on Employment Opportunity

The effectiveness of BART's permanent employment practices in improving employment opportunity for minorities in transit within the region can be observed from the minority participation in the BART work force compared to other transit agencies which would serve the region in the absence of BART. A consistent research approach to this issue would require comparing a profile of the work force of all transit agencies in the three counties with BART, adding 600 employees to the NBA profile, according to a hypothetical racial and sex distribution. To reduce the number of assumptions, the sex comparison is made between BART's current work force and the current work force of AC Transit and MUNI.[1] This comparison probably improves the appearance of BART's performance over the NBA, since any additional NBA employees would have been hired under current EEOC guidelines.

The classification of the BART work force by race or ethnicity and salary in 1976 is contained in Table IV-6. The classification by sex is contained in Table IV-7. The sources of these data, as well as those in subsequent tables in this section, are the Equal Employment Opportunity Commission (EEOC) reports. The EEOC requirement also classifies employment into eight job categories: officials/administrators, professionals, technicians, protective service, paraprofessionals, office and clerical, skilled craft and service maintenance, although the definition of jobs by these classifications may differ among agencies. Employees in each job category are further classified by race or ethnicity and sex in Tables IV-8 and IV-9. The rubric "minority" includes Black, Spanish-American, American Indian, Asian and other nonwhite.

---

[1] The alternative to BART (the NBA) was defined here to reflect the characteristics of another public transit agency, since BART is a public agency and its employment opportunity effectiveness should be compared with a realistic alternative. Thus Greyhound statistics — which were difficult to obtain for hypothetical service — were not included.

Table IV-6

IMPACT OF BART ON MINORITY EMPLOYMENT BY PUBLIC TRANSIT IN THE BAY AREA BY SALARY LEVEL

	BART Employees					AC Transit and MUNI				
	White		Minority			White		Minority		
Salary Levels	Number	% of Total	Number	% of Total	% of Category	Number	% of Total	Number	% of Total	% of Category
$ 0- 7,999	0	0	0	0	-	10	0.2	6	0.2	38
8,000-12,999	43	3.8	57	7.6	57	460	16.8	387	14.7	46
13,000-15,999	195	17.5	195	26.0	50	1,096	40.1	988	37.6	47
16,000-24,999	796	71.4	485	64.7	38	1,028	37.6	1,189	45.2	54
$25,000+	81	7.3	13	1.7	14	144	5.3	61	2.3	30
TOTAL	1,115	100%	750	100%	40	2,738[1]	100%	2,631[1]	100%	49

---

[1] The NBA total would increase by 600 employees in the absence of BART. These 600 additional employees are not reflected in the totals. They would probably be distributed more propitiously than existing employees because of affirmative action hiring practices.

Source: Equal Employment Opportunity Commission, Local Government Information System, 1976.

Table IV-7

IMPACT OF BART ON FEMALE EMPLOYMENT IN PUBLIC TRANSIT IN THE BAY AREA BY SALARY LEVEL

Salary Levels	BART Employees					AC Transit and MUNI				
	Male		Female			Male		Female		
	Number	% of Total	Number	% of Total	% of Category	Number	% of Total	Number	% of Total	% of Category
$ 0- 7,999	0	0	0	0	-	11	0.2	5	1.0	31
8,000-12,999	35	2.3	65	18.5	65	504	10.4	343	72.3	40
13,000-15,999	246	16.2	144	41.0	37	1,980	40.4	104	22.0	5
16,000-24,999	1,141	75.4	140	39.9	11	2,196	44.9	21	4.4	1
$25,000+	92	6.1	2	0.6	2	204	4.1	1	0.3	-
TOTAL	1,514	100%	351	100%	19	4,895[1]	100%	474[1]	100%	9

---

1. The NBA total would increase by 600 employees in the absence of BART. These 600 additional employees are not reflected in the totals. They would probably be distributed more propitiously than existing employees because of affirmative action hiring practices.

Source: Equal Employment Opportunity Commission, Local Government Information System, 1976.

Table IV-8

BART EMPLOYMENT IMPACT ON MINORITY OPPORTUNITY BY JOB CATEGORY, 1976

	BART Employees					AC Transit and MUNI				
	White		Minority			White		Minority		
Job Categories	Number	% of Total	Number	% of Total	% of Category	Number	% of Total	Number	% of Total	% of Category
Officials/Administrators	207	19	88	12	30	142	5	27	1	16
Professionals	159	14	57	8	26	145	5	135	5	48
Technicians	32	3	14	2	30	119	4	81	3	41
Protective Service	49	4	38	5	44	112	4	39	1	26
Paraprofessionals	15	1	11	1	42	9	1	2	1	18
Office/Clerical	99	9	88	12	47	379	14	191	7	34
Skilled Craft	457	41	324	43	41	431	16	133	5	24
Service/Maintenance	97	9	130	17	57	1,398	51	2,067	77	60
TOTAL	1,115	100%	750	100%	40	2,735[1]	100%	2,676[1]	100%	49

---

[1] The NBA total would increase by 600 employees in the absence of BART. These 600 additional employees are not reflected in the totals. They would probably be distributed more propitiously than existing employees because of affirmative action hiring practices.

Source: Equal Employment Opportunity Commission, Local Government Information System, 1976.

Table IV-9

BART EMPLOYMENT IMPACT ON FEMALE EMPLOYMENT OPPORTUNITY BY JOB CATEGORY

	BART Employees					AC Transit and MUNI				
	Male		Female			Male		Female		
Job Categories	Number	% of Total	Number	% of Total	% of Category	Number	% of Total	Number	% of Total	% of Category
Officials/Administrators	288	19	7	2	2	161	3	8	1	5
Professionals	179	12	37	11	17	258	5	23	5	8
Technicians	46	3	0	0	0	195	4	5	1	3
Protective Service	68	5	19	5	22	151	3	0	0	0
Paraprofessionals	16	1	10	3	38	10	1	1	1	9
Office/Clerical	46	3	141	40	75	217	4	353	69	62
Skilled Craft	683	45	98	28	13	564	12	0	0	0
Service/Maintenance	188	12	39	11	17	3,345	68	120	23	3
TOTAL	1,514	100%	351	100%	19	4,901[1]	100%	510[1]	100%	9

---

[1] The NBA total would increase by 600 employees in the absence of BART. These 600 additional employees are not reflected in the totals. They would probably be distributed more propitiously than existing employees because of affirmative action hiring practices.

Source: Equal Employment Opportunity Commission, Local Government Information System, 1976.

a. Employment Opportunity for Women on the Work Force

Within BART's work force, the percentage of female employees is 18.8. Without BART, the total regional transit work force would employ only 8.8 percent females. Overall, BART's impact on female employment opportunity has been relatively strong, compared to other transit agencies.

The difference between BART's influence on employment opportunity and that of the older bus systems is more evident in the salaries paid female employees. Almost three-quarters of the female employees at the bus systems earn less than $13,000 per year. By comparison, only 18.5 percent of BART's female employees earn less than $13,000. Over 40 percent earn more than $16,000 per year at BART, while fewer than five percent at the older agencies earn that much. It appears that BART's hiring practices during a period of feminist initiatives provided BART with the opportunity to improve opportunities for women on its staff. Still, women are best represented in office and clerical assignments.

The statistical review of employment data by race and sex suggests that BART — as a new agency, regional in nature, of high technology origins and free from traditional patterns of employment — has been able to achieve a greater record in hiring females, rewarding them, and placing them in positions of responsibility, than the traditional urban bus systems. The fact that the bus systems have the largest share of their employees in traditionally male trades may contribute to the higher male representation.

b. Employment Opportunity by Race or Ethnicity

Forty percent of BART's work force is classified as minorities, i.e., Black, Spanish-American, Asian, American Indian or other non-white. The minority participation in the bus transit agencies totals 49 percent.

In hiring an entirely new work force, BART was able to improve job status of many of the minorities in its work force and employ a higher percentage of minorities than is representative in the population. Table IV-6 summarizes employees by salary level and minority—non-minority classification.

It appears that the older bus systems in the Bay Area have a greater minority participation rate, perhaps as a result of entry level positions in driver and mechanic roles, which have traditionally been perceived as available to minorities. BART, on the other hand, has presented the higher technology image, which might discourage application by the minority unemployed without a technical education.

BART permanent employment data by job category and salary range provide a different impression of the employment opportunity differential between BART and older agencies, especially for minorities. Tables IV-6 through IV-9 summarize these data. No cross-tabulation for salary and job category was available. In both BART and the other agencies, there was stronger minority representation in the operating jobs than the administrative.

The salary scale of employees by race may provide one indication of whether responsibility within the organization remains the bailiwick of white males or is shared with minorities and women (clearly an uneven surrogate, since tenure may be more influential in salary scales than responsibility).

At BART, 66.4% of the minorities earn more than $16,000 per year, while only 47.5% of the minorities at bus transit agencies exceed that salary. On the other hand, in the highest salary range, over $25,000 per year, there are five times as many whites as minorities at BART, while only slightly more than twice as many in the bus transit agencies.

B. The Tax Burden and Impact of Financing BART Operations

The tax burden and impact of constructing BART is typical only of BART, since, as was pointed out earlier, a far greater share of BART's cost was met by local taxpayers than is now the case elsewhere in the nation. Financing the costs of operating BART, on the other hand, reflects more closely the experience which may be faced by other transit agencies operating rail rapid transit.

1. The Impact of Financing BART Operations

The costs of operating BART for the "typical" operational year used in this research have been estimated as $55.8 million by the BART Impact Program.[1] Nearly 42 percent of this operating budget was paid from the farebox. The three other local sources of revenue which were primarily responsible for offsetting the BART operating deficit were property tax (for administrative expenses), the sales tax and interest paid on BART bank deposits. BART also receives some federal funding.

---

[1] The annual operating expense estimate of $55.8 million made by the Metropolitan Transportation Commission's BART Impact Program staff (12) does not agree with the estimate of operating expenditures of $59.8 million which was used in the assessment of impacts of operations on the economy and was derived from BARTD financial records (pp. I10-M10). The former estimate includes only costs that were incurred to provide services during fiscal year 1975/76. The latter includes all expenditures that year except capital improvements, such as inventory increases and replacements as well as direct operating costs. The former figure is appropriate to the analyses of fiscal burden but expenditure impacts on the economy are proportional to total cash outlays.

MUNI would have an increased deficit in the NBA scenario, but AC Transit would have a surplus without BART, since it would carry more passengers on its profitable long-haul transbay routes. Greyhound would also provide additional service and incur additional losses, but the operating deficits for Greyhound are assumed to have been provided from operating surpluses in other regions served by Greyhound Bus Lines. Therefore, Greyhound service would have no local tax burden impact, although it would be providing a hidden subsidy from other routes, essentially an exported tax burden.

The primary source of AC Transit deficit financing is a property tax in the AC Transit District, which comprises portions of Alameda and Contra Costa Counties. MUNI's deficit financing comes from the general fund of the City and County of San Francisco, and it has been assumed that any increased deficit would be financed through a reduction in service in other municipal programs, rather than an increase in the general property tax. As a result, there may be an impact in terms of local services, but there is not an impact in terms of tax burden on residents, who pay the same tax in either case.

The BART impact on transit operating costs and revenues or the difference between the costs and revenues from operations with BART or without BART in 1976 is reflected in Table IV-10. As the table indicates, the BART impact has been a reduction

Table IV-10

BART IMPACT ON THE OPERATING COSTS AND FINANCING
OF REGIONAL TRANSIT
FISCAL YEAR 1975/76
(In Thousands)[1]

	AC Transit	MUNI	BART	Net Impact
Operating Expenditure Impact	($1,451)	($7,721)	$55,853	$46,681
Operating Revenue Impact[2]				
Fares and Interest	($2,350)	($2,638)	$23,221	$18,233
Property Tax	$ 899	--	$ 5,029	$ 5,928
Sales Tax	--	--	$21,021	$21,021

---

1. Numbers in parentheses are negative numbers indicating that the value in the NBA scenario is greater than the value in the BART scenario.

2. Revenue impact does not equal expenditures impact in each case because MUNI's financing has no property tax impact, nor does BART's unfunded deficit have any effect on federal or State tax rates.

Source: Metropolitan Transportation Commission (12).

in operating costs for both AC Transit and MUNI (of $1.451 million and $7.726 million, respectively). The BART impact on regional transit operating revenues has been one of lowering the farebox revenue which might have been accrued by AC Transit or MUNI (by $2.35 million and $2.638 million, respectively). The net impacts of BART's operations have been an increase of nearly $47 million per year in operating costs, funded by $18 million more in fares, almost $6 million in property taxes and over $21 million in sales tax.

The BART impact on regional transit financing had an interesting effect on AC Transit's property tax requirements. Since AC Transit would experience an operating surplus from the additional ridership in the absence of BART, without BART the Alameda-Contra Costa Transit District could lower its property tax rate. In other words, the financing requirements for AC Transit are higher with BART operating than they would be without BART (at higher levels of AC Transit service). As explained below, this property tax dividend to Alameda and Contra Costa County property owners under the NBA scenario might be even greater, as a result of a redistribution of state and federal funds.

BART's financing plan includes some $6.6 million of funding from other state or federal sources, including nearly $6.2 million in California Transportation Development Act (TDA) funds. These funds, by legislative mandate, would be allocated to the region even in the absence of BART. They would be spent to defer the operating expenses incurred by AC Transit and MUNI. A portion of the TDA funds (almost $2 million) would reduce the unfunded portion of MUNI's costs. An estimated $2.9 million of TDA funds would be allocated to AC Transit and AC could reduce the funds it collects from property tax or expand service.

This increase in TDA funding would reduce the burden on the property tax by an additional $2.9 million, or 19 percent, if the same level of service were maintained. The incidence analysis reflects only the $899,000 annual tax dividend to residents of the Alameda-Contra Costa Transit District if BART were not a reality. The impact of this distribution of funds should not be overlooked.

2. The Impact of BART Operations

The final fiscal impact of BART operations depends on the incidence characteristics of property and sales taxes – the only local sources of financing other than fares. A single fiscal year – 1975-1976 – was used as a typical operating year for the impact analysis.

a. Property Tax

The annual administrative costs of BART are supported by a property tax which is not to exceed five mills under the enabling legislation. In fiscal year 1976, BART raised $5 million for administrative expenses with the property tax. An additional BART impact on the property tax was the higher AC Transit District property tax necessary to maintain AC Transit service with BART.

Table IV-11 indicates the incidence of annual operating costs supported by the property tax. Almost 64% of the operating cost impact is borne by households, with a heavier portion of the burden falling on the households of Alameda and Contra Costa Counties, because of their support of the AC Transit District. Alameda County taxpayers bear 44.6 percent of the BART property tax, while 27.7 percent is borne by Contra Costa taxpayers and 27.7 percent is borne by San Francisco taxpayers. The cost of operating BART, which is supported by the property tax in each of the three BART counties, is approximately one-half of one percent of the total property tax bill in each county.

Table IV-11

BART'S PROPERTY TAX IMPACT FOR OPERATING REQUIREMENTS
FISCAL YEAR 1976
(Thousands of Dollars)

Incidence Sector	Total (in thousands)	Percent of Total	
Total Households			63.9%
Homeowners	$1,819.4	30.7%	
Renters	743.1	12.5%	
Homeowners or renters (not separately distinguishable)[1]	$1,227.0	20.7%	
Total Business			24.8%
Population-Serving Industry	545.5	9.2%	
Basic Industry	925.6	15.6%	
Property Tax Relief Paid by California State General Fund	669.2	11.3%	11.3%
Unallocated[2]	– 1.5	0.0%	0.0%
TOTAL	$5,928.3	100.0%	100.0%

---

1. Significant amounts of property could not be classified as being occupied by homeowners or renters due to discrepancies in homeowner exemption data. The distinction is not crucial since the same assumptions about shifting of tax burden were used for both groups.

2. Unallocated represents taxes levied but not collected.

Source: McDonald & Grefe, Inc.

b. Sales and Use Tax

Most of BART's operating deficit is funded by a half-percent sales tax on retail sales in the three BART counties.

For the "typical" BART operating year, the BART financing plan indicates $21 million was spent on operations from sales tax revenues. The estimated final incidence of the sales tax burden is shown in Table IV-12.

c. Fares

In the absence of data on the characteristics of the riders of the No-BART Alternative, any analysis of the BART patronage alone would not represent the true impact of BART on fares paid by transit riders. Nonetheless, tabulations of the 1976 BART Passenger Profile Survey indicate certain socioeconomic characteristics of those who pay BART's fares. The Passenger Profile Survey was distributed to a sample of 12,210 patrons on station platforms. The survey was conducted at three to five stations each day over a period of seven days. Patrons returned 8,985 questionnaires (11).

The analysis classified survey responses by commuters and noncommuters, indicating peak and off-peak statistics and the daytime total. One of the interesting observations is that BART utilization by noncommuters during the off-peak hours was substantial, compared to the commute patronage. The commuter tended to have a higher average fare and paid almost 58 percent of the total farebox revenue for daytime travel. Nearly 91 percent of the riders during the daytime were also residents of the BART District. In other words, those who were bearing the BART cost through the sales and property taxes were not subsidizing, to any great degree, residents of other counties that use the system. During the peak period, the percentage of riders who were from outside the BART District reached an adjusted high of 11 percent.

Table IV-12

FINAL INCIDENCE OF SALES TAX BY COUNTY AND DISTRICT
BART FY 1976 OPERATING BUDGET
(In Thousands of Current Dollars)

	Counties							
	Alameda		Contra Costa		San Francisco		Total	Percent of Total
Household	$6,390	70.7%	$3,300	70.4%	$5,108	70.0%	$14,798	70.4%
Business	1,745	19.3%	925	19.7%	1,451	19.9%	4,121	19.6%
Export	904	10.6%	462	9.9%	736	10.1%	2,102	10.0%
TOTAL	$9,039	100.0%	$4,687	100.0%	$7,295	100.0%	$21,021	100.0%
% of Total	43.0%		22.2%		34.7%		100%	

Source: McDonald & Grefe, Inc.

Almost 71.5 percent of the peak period passengers who classified themselves by income earned more than $10,000 per year. (See Table IV-13.) Among the total daytime patronage, nearly 65 percent of the respondents classified their income as exceeding $10,000. Moreover, the average fare paid by passengers increases with income group. While this does not necessarily address the issue of equity, since it may reflect BART's routes and the communities it serves on the longer rides that have a higher fare, it does project a profile of middle-class patronage.

Table IV-13

BART FARE PAYMENTS CLASSIFIED BY INCOME OF RIDER

RESPONSE WEIGHTED FOR SAMPLING RATIO
AND RESPONSE RATE VARIATIONS

CATEGORY	TOTAL NO. OF RESPONSES	PERCENT OF TOTAL RESPONSES	TOTAL AMOUNT PAID	PERCENT OF TOTAL PAID	AVERAGE FARE PAID
PEAK PERIOD					
UNDER $7000		10.9	$	9.8	$ .58
$7000 TO 9999		10.9	$	9.7	$ .67
$10000 TO 14999		17.4	$	16.8	$ .73
$15000 TO 19999		14.1	$	14.1	$ .75
$20000 TO 24999		15.4	$	16.2	$ .79
$25000 TO 49999		19.0	$	22.0	$ .87
$50000 OR MORE		1.9	$	2.4	$ .94
NOT IDENTIFIED		10.4	$	9.0	$ .65
TOTAL	44834.	100.0	$ 33729.	100.0	$ .75
OFF PEAK					
UNDER $7000		23.6	$	21.4	$ .54
$7000 TO 9999		11.1	$	10.6	$ .67
$10000 TO 14999		15.9	$	15.5	$ .69
$15000 TO 19999		11.3	$	12.0	$ .75
$20000 TO 24999		11.0	$	12.6	$ .81
$25000 TO 49999		12.5	$	14.1	$ .80
$50000 OR MORE		2.3	$	2.0	$ .80
NOT IDENTIFIED		12.3	$	11.2	$ .54
TOTAL	46690.	100.0	$ 32976.	100.0	$ .71
DAY TIME TOTAL					
UNDER $7000		17.4	$	15.5	$ .65
$7000 TO 9999		11.0	$	10.1	$ .67
$10000 TO 14999		16.6	$	16.2	$ .71
$15000 TO 19999		12.7	$	13.1	$ .75
$20000 TO 24999		13.1	$	14.4	$ .80
$25000 TO 49999		15.7	$	18.1	$ .84
$50000 OR MORE		2.1	$	2.5	$ .86
NOT IDENTIFIED		11.4	$	10.1	$ .65
TOTAL	91524.	100.0	$ 66705.	100.0	$ .73

Source: McDonald & Grefe, Inc.

Table IV-14

FINAL INCIDENCE OF OPERATING SUBSIDIES
BART IMPACT IN FY 1976
(In Thousands of Current Dollars)

	Property Tax		Sales Tax		Total	% of Total
Household	$3,790	63.9%	$14,798	70.4%	$ 18,588	69.0%
Business	1,471	24.8%	4,121	19.6%	5,591	20.7%
Export	669	11.3%	2,102	10.0%	2,771	10.3%
TOTAL	$5,928	100.0%	$21,021	100.0%	$26,948	100.0%
% of Total	22.0%		78.0%		100.0%	

Source: McDonald & Grefe, Inc.

d. Total Burden of Financing BART Operations

The impact of BART's operations on tax burden within the region is summarized in Table IV-14. This table summarizes the final incidence of the sales tax and property taxes necessary for supporting BART operations. It answers the broad question of who pays for the portion of BART's operations not paid by those who ride the system.

Sixty-nine percent of the annual operating deficit is paid by households, as homeowners, renters or consumers. The type of impact this financing plan has on individual households of different income levels is summarized in the next section.

Business bears the cost of nearly 21 percent of BART's operations. When the final incidence falls on business, it implies that the burden has not been shifted forward to the consumer, but rather borne as a cost of doing business. Slightly more than 10 percent of the cost of BART which is funded with local taxes is actually exported to taxpayers from outside the region, either as reimbursements from the State General Fund or as purchases by tourists or businesses located outside of the BARTD counties.

3. Final Incidence of BART Operating Costs for Typical Households

The impact of BART's financing on the income of a range of typical households — with different incomes, family sizes and consumption patterns — was measured to provide an indicator of the progressivity or regressivity of the financing and the relative magnitude of the burden. A representative range of household sizes, incomes and age groups was selected for this purpose. The tax incidence for BART operating expenses was analyzed as a percentage of household income. For a detailed description of these households, see (5).

In Table IV-15, the typical households are arranged in order of increasing household income with their associated tax burdens. Here, the nature of BART financing can be seen most clearly. The financing of capital and operating costs of BART shows a pattern of decreasing burden as a percent of household income, as household income increases. The greatest relative burden of financing operating costs, in this analysis, falls on the group represented by a retired individual with a lower living standard. Similarly, a high relative burden is borne by a poverty-level family of four. The affluent family of four has the lowest relative tax burden for the financing of operating expenses.

As indicated in discussing the burden of the capital costs, the regressivity of BART's financing is not particularly different from the regressivity of the financing of most public programs.

Table IV-15

TAX BURDENS OF TYPICAL HOUSEHOLDS FOR BART OPERATING EXPENSE IMPACT, 1975-76

Household Description	Income	Property Tax	Sales Tax	Total Tax Burden	Tax Burden as Percent of Income
Family of 4, poverty-level living standard, female head of household	$ 2,362	$1.30	$ 3.95	$ 5.25	0.22%
Individual, lower living standard, over 65, retired	$ 4,489	$2.68	$ 8.30	$10.98	0.24%
Couple, low-moderate living standard, head over 65	$ 6,851	$2.87	$11.86	$14.73	0.21%
Family of 3, low-moderate living standard	$ 8,859	$4.06	$13.83	$17.89	0.20%
Individual, low-moderate living standard	$10,041	$1.90	$13.44	$15.34	0.15%
Couple, low-moderate living standard	$10,277	$4.06	$13.83	$17.89	0.17%
Family of 3, moderate living standard	$14,411	$4.06	$13.83	$17.89	0.12%
Couple, moderate living standard	$15,711	$4.20	$17.79	$21.99	0.14%
Family of 6, moderate living standard	$18,191	$4.70	$22.20	$26.90	0.15%
Family of 4, high living standard	$21,735	$4.86	$24.50	$29.36	0.13%
Family of 4, affluent living standard	$45,715	$8.53	$33.20	$41.73	0.09%

Source: McDonald & Grefe, Inc.

V. BART'S IMPACT ON ACCESSIBILITY TO EMPLOYMENT AND ITS USE FOR BUSINESS

Evaluating the impact of BART on the competitive advantage of the region's business and commerce requires comparison of the potential work force's accessibility to employment, both with BART and without BART. This analysis focuses upon accessibility to employment for actual and potential members of the labor force, including underemployed and ethnic minorities, since better utilization of these labor resources would represent a notable economic impact.

The approach assumes travel time provides an appropriate measurement of accessibility to employment in that it reflects the relative ease or difficulty with which a worker can travel to a job. If BART were to provide a substantial improvement in work-trip travel time for underemployed and unemployed groups, this could be interpreted as improved accessibility to employment for these groups. Conversely, if employment is more accessible to the population, industry perceives a regional economic advantage from improved access to a larger work force.

This study also evaluates actual BART usage by various socioeconomic subgroups in their journeys to work. Data from the 1976 BART Passenger Profile Survey were utilized to determine patterns of usage of BART for the journey to work. See (13) for discussion of the analysis, significance and the shortcomings of the results. A third accessibility issue with economic implications is the impact of BART on business efficiencies. Data from the Passenger Profile Survey were utilized to determine the amount of business-related BART usage.

A. Employment Accessibility

The analysis of the potential impact of BART on job accessibility during peak period travel is summarized in Table V-1. The table indicates that BART offers average travel time improvements to high employment centers[1] for all socioeconomic groups shown. The degree of improved potential average accessibility to employment offered by BART is not as great for the "disadvantaged" groups as for the total population and higher income groups. In aggregate, BART offers a potential 19 percent improvement in average travel time (i.e., 8 minutes less travel time) over the NBA to the top 100 employment zones for the total population. Higher income households experience an even

---

[1] Defined as the 100 traffic zones in the six-county area with the highest employment. Sixty of these are in the three BART counties.

Table V-1

AVERAGE ACCESS TIME FROM ALL ZONES IN THE THREE-COUNTY REGION TO EMPLOYMENT CENTERS
(In Minutes)

Population Subgroup	Without BART	With BART	Difference	Percent Difference
Total Population	43	35	8	19
Households below Poverty Level	31	28	3	10
Households with High Incomes	46	36	10	22
Blue Collar	43	35	8	19
Unemployed	37	32	5	14
Households without Automobiles	25	24	1	4
Non-White	30	27	3	10

---

1. Defined as the top 100 employment zones within the six-county area.

Source: Peat, Marwick, Mitchell & Co., "Analysis of BART's Accessibility Impacts," prepared for the Metropolitan Transportation Commission, December 1976, p. 36.

greater travel time saving with BART, 22 percent.[1] Households below poverty level and nonwhite households would save only 10 percent in their average journey to work if it were to one of the top 100 employment zones.[2]

These transportation benefits of BART service may appear to favor higher income households disproportionately. Part of the reason the lower income groups experience less benefit from BART, however, is that their residential neighborhoods would be served by very good bus service with BART or the NBA, reducing the difference in the travel time between the two scenarios.

---

[1] Higher-income households are defined as having incomes greater than $20,000 per year, according to the 1970 Census. Households below the poverty level, according to the 1970 Census, are those earning less than $4,000 per year.

[2] It should be understood that the analysis considers average potential travel time from zone to zone. Travel time between individual zones can be significantly above or below the average.

Any comparison of the travel time advantages of BART must be compared to an alternative transportation system. The findings of this analysis will be heavily conditioned by the definition of the No-BART Alternative. The NBA is assumed to consist of a high level of bus service, a level of service which has particularly strong implications for the residential zones which are not located on the BART line. The difference between the type of service received in these neighborhoods with and without BART will be small. If the majority of low-income households live in these neighborhoods, BART will not appreciably change their access to employment accessibility. Despite this observation, it may not imply that BART is failing to serve its transportation objectives, which at the time it was planned, did not include specifically serving low-income households as such.

An important public policy question is whether BART did improve access to employment for the unemployed, regardless of its intention. The average access time for the unemployed from all zones in the three-county region to the one hundred top employment zones within the nine-county area was reduced 14 percent, reflecting a five-minute difference in the average access time between BART's 32-minute average travel time and the NBA's 37-minute travel time. Is this significant? Under the theory that the unemployed have a lower time value than the employed or higher income households, probably not. In behavioral terms, it is unlikely that the employment opportunity was perceived as considerably greater with BART than it would have been without BART, despite the statistically improved average accessibility. Certainly, the difference is not substantial enough to outweigh the arguments that unemployment is less a function of accessibility than better information on employment opportunities, social situations and training.

Improvement in access for the employed, particularly households with high incomes, is considerably greater. The average access time for households with high income improves 22 percent, a 10-minute improvement over the 46-minute average access time without BART. This socioeconomic characteristic of BART service probably satisfies one of its early transportation objectives, although that objective was not explicitly to serve higher-income households, but to relieve the congestion pressures on long-haul highway corridors, from the suburbs into the City. From Table V-1, it would appear that it succeeds in this objective if the households with higher income are those which reside in the suburbs. It also indicates that the NBA is less effective in serving the transportation needs of the residential patterns of households with high incomes.

The importance of these characteristics of BART's impact on accessibility to employment for other areas planning rapid transit is dependent on the objectives of rapid transit in those areas. If the objective is to increase employment accessibility for the unemployed, the transit alternatives must specifically serve the residential communities in which the unemployed or low-income households reside. If a fixed guideway system does not serve those communities, or if the route to employment opportunity for residents of those neighborhoods is inconsistent with the route of the fixed guideway system, there may be very little difference reflected between the rail alternative and a bus alternative.

B. Racial Characteristics of BART Riders

Public policy concern with the potential improvement to employment accessibility through transit service does not bear only on the unemployed, generally. There is also concern that transit improve the employment opportunities of minorities. The impact of BART service on accessibility to employment among minorities relates to the issues of the previous section. Table V-2 illustrates the racial characteristics of BART riders and Table V-3 reflects the racial characteristics of the BART service area.

The racial characteristics of BART riders are taken from the BART 1976 Passenger Profile Survey. In fact, this survey relates patronage characteristics only to AM peak and off-peak and represents trips rather than riders. Therefore, the same passenger could make several trips and would show up in the survey response more than once. For ease of description, the word "rider" is used for "trip".

Table V-2

RACIAL PROFILE OF BART RIDERS MAKING TRIPS DURING AM PEAK PERIOD

White	72.7%
Black	11.2%
Spanish-American	5.9%
Asian	8.4%
Other	1.8%
	100.0%

Source: BART 1976 Passenger Profile Survey

Table V-3

RACIAL PROFILE OF THE THREE BART COUNTIES

	Alameda	Contra Costa	San Francisco
White	67.2%	80.7%	57.2%
Black	15.0%	7.5%	13.4%
Spanish-Surname	12.6%	9.3%	14.2%
Other	5.2%	2.5%	15.2%

Source: U.S. Bureau of the Census, 1970.

Table V-4 illustrates the number of BART riders, by racial or ethnic characteristics, whose work trip destinations are within the central business districts of either San Francisco or Oakland. The percentages of work trip destinations among riders is quite similar for the four racial or ethnic groups evaluated. While this reflects the employment opportunity in each of these central business districts, it also indicates that the home-to-work trip to either of these areas of high employment potential does not serve any single racial or ethnic group disproportionally. (Naturally, this conclusion, and the previous one, could be misleading if data on employment by racial or ethnic characteristics within these central business districts showed a disproportionate number of jobs were held by any single ethnic group.)

Examination of passenger profile data did reveal that there is some evidence of reverse commuting from urban residential areas having a high proportion of minority residents to suburban areas, but the magnitude appears small. This would indicate that the impact of BART on transporting urban disadvantaged groups to suburban locations of employment has not been great.

Table V-4

PERCENTAGES OF RACIAL GROUPS RIDING BART HAVING DESTINATIONS IN HIGH EMPLOYMENT CENTERS

Employment Center	White	Black	Spanish-American	Asian
SAN FRANCISCO CENTRAL BUSINESS DISTRICT				
Civic Center	9%	13%	6%	7%
Powell Street	11%	8%	11%	11%
Montgomery Street	28%	22%	28%	31%
TOTAL	48%	43%	45%	49%
OAKLAND CENTRAL BUSINESS DISTRICT				
Lake Merritt	2%	3%	3%	3%
MacArthur	1%	2%	2%	0%
19th St. Oakland	7%	5%	5%	7%
12th St. Oakland	5%	5%	5%	3%
TOTAL	15%	15%	15%	13%
Other Work-Trip Destinations	37%	42%	40%	38%
TOTAL Work-Trip Destinations by Race	100%	100%	100%	100%

Source: 1976 BART Passenger Profile Survey, Metropolitan Transportation Commission.

C. Business Use of BART

If substantial use of BART were made by employees in the course of business, it might be possible to identify an efficiency advantage from BART's transportation service for Bay Area businesses. It could be conjectured that uses ranging from executives meeting for lunch to rapid and secure messenger service could be facilitated by the use of BART, particularly between the business centers of San Francisco and Oakland and the growing employment nodes in the suburbs. In fact, less than 1.4% of the responses to the BART Passenger Profile Survey in 1976 indicated business-related use of BART during the peak period, and 10.2% during the off-peak. While there were strong indications in the interviewing program that business use that does occur would not be replaced by use of alternate transit modes without BART, neither the ridership statistics nor the interviewing program indicates a significant impact.

VI. EFFECT OF TRANSIT SERVICE ON THE COMPETITIVE ADVANTAGE AND EFFICIENCY OF BAY AREA BUSINESS OPPORTUNITIES

The Composite Report which described BART to the voters in 1962 expressed an expectation that prevails in transportation planning today: "The rapid transit system would improve the area's living and working conditions, economic efficiency and availability of workers, and attract a larger share of the nation's future growth." The living and working conditions of the region could be improved by reducing the time and cost of the journey to work and to recreation. Economic efficiency would be enhanced if BART could be used to expedite or facilitate the daily business interaction of employees or firms. The availability of workers would be increased through improving accessibility to employment for the population of the region, simultaneously affecting the employment opportunity of the unemployed and the size of the work force accessible to any employer.

This section evaluates the implication which each of these improvements might have on the broader economic profile of the region. Will rapid transit, through improving working conditions, economic efficiency, the availability of workers and the employment opportunity of the population, increase the productive use of regional resources to the extent that the region has a competitive advantage in attracting future national growth? Will the region attract more than its share of new economic growth? Will the effect of transit on productivity of the region's resources, and even its effect on the region's image, cause corporations to locate (or expand) in this region rather than another?

The research approach involved identifying whether the Bay Area did receive a greater share of national growth during the time period that BART might have influenced location decisions. If so, was this growth the result of BART?

The evaluation of BART's impact on regional development does not involve changes in corporate location within the region, as a result of BART. Intraregional location decisions represent land use impacts and would have no net effect on the economic activity of the entire region.[1]

A. Shifts in Bay Area Employment Since 1965

The total increase (or decline) in employment in any industry can be described by comparison with three standards:

---

[1] The Land Use and Urban Development Project will address intraregional location decisions.

- Total employment growth in all industries;
- Employment growth in the industry being considered; and
- Employment growth in the industry in a particular geographic region, compared to total growth in the industry.

The third component provides an indication of the "competitive shift" in employment for a given industry in a region and may indicate that the region has a competitive advantage, compared to other regions in the United States.[1]

The same type of analysis can begin with an employment base smaller than the entire United States. Employment increases can be compared using a state or a region as a base, and a smaller geographic area (e.g., the BART counties) as the area being studied. Such an analysis was used as the first step to isolate competitive shifts that occurred between 1965 and 1973, and that might have been the result of BART.

For the purposes of this analysis, it has been assumed that no major relocation to the Bay Area on account of BART would have occurred for at least two years after settlement of the 1963 taxpayers' suit, which assured the legitimacy of BART's mandate. On the other hand, by 1973, some decisions based on original projections of service commencement or even actual service should have been implemented.[2] While this does not suggest that an industrial location decision which will be made on account of BART (if any) would have occurred by 1973, it was necessary to select a recent year, for which data were also adequate, to compare with the pre-BART condition.

The employment in 66 Bay Area industries or industry groups was evaluated to determine which industry group increased employment to an extent which could not be explained by national trends in economic growth of each sector or comparable changes in the industry mix of the economy of other headquarters cities. The analysis revealed five industry groups which appeared to gain substantially more employment than could be explained by comparison with other areas. It could be that this unusual growth might have been a result of BART.

Table VI-1 identifies the industry groups with otherwise unexplained growth and illustrates how they fared in the Bay Area, relative to 16 other metropolitan areas which are primarily

---

1. The analysis of employment growth by component is referred to as shift/share analysis. For a complete discussion and summary of findings, see (8).

2. It is possible that the bad press BART received in the early 1970s and its failure to meet service-level expectations have deterred economic development which might eventually occur. This hypothesis would warrant a revision of this analysis at some future date more likely to be associated with full-service levels. Even if data had been available for the years between 1973 and 1976, it is unlikely that there would be any substantial change in the findings.

Table VI-1

SHIFTS IN EMPLOYMENT IN THE BART COUNTIES
1965-1973

	Competitive Shift in Employment in the BART Counties (as Percent of 1965 Employment)		
Sector	Compared to Other Headquarters SMSAs[1]	Compared to West Coast SMSAs[1]	Compared to Nine-County Bay Area
Government	+ 40%	+ 38%	+ 44%
Central Office[2] (except manufacturing)	+225	+182	- 10
Services	+ 15	- 5	- 7
Finance	+ 17	- 2	- 5
Manufacturing	+ 5	- 14	- 20

---

1. For other headquarters SMSAs (Standard Metropolitan Statistical Area), see (8).

2. Ancillary central office employment includes financial, construction, transportation and service firms' administrative and auxiliary units.

Source: McDonald & Grefe, Inc.

corporate headquarters and business centers. It also compares their growth with the industrial growth experienced in seven West Coast metropolitan areas. Finally, it compares the three-county BART service area with the experience of the nine-county Bay Area. This final comparison was made to observe any locational shifts from the outer six counties into the BART counties on the basis of perceived locational advantages associated with BART, particularly with greater local information on the expectations of BART.

In comparison with other headquarters SMSAs, the industry groups which provide the majority of employment in the BART service area showed a positive competitive shift in employment over the time period 1965 to 1973. The only exception was construction, which tends to confirm the conclusion (in Section III) that the construction industry was able to absorb BART construction without inflationary impacts during this period, partially because it was not fully utilized.

Table VI-1 illustrates that the employment in the dominant sectors of the BART service area grew at a faster pace than in other metropolitan areas in the country, although this performance was less dynamic in comparison with the growth experienced by West Coast metropolitan areas. Comparison of the three-county BART service area economy with other West Coast SMSAs and with the nine-county greater Bay Area indicates that only the government sector and the central office function show a consistent competitive shift.

B. Investigation of BART's Impact on Competitive Shifts

The numerical analysis of shifts in employment was intended to identify industries that *possibly* had enjoyed a competitive advantage because of BART. It could not be said to *demonstrate* a causal mechanism. In order to isolate a BART impact from this conclusion, an interview program was undertaken to explain the reasons, or causal mechanisms, for these exceptional growth patterns. Were these competitive shifts due to the attractiveness of the Bay Area and West Coast generally, or did BART's anticipated service contribute to the attractiveness?

The impacts of BART itself could only be determined by questioning decisionmakers and informed officials as to how BART may have affected their location decisions or operations. Case studies were written to document the findings in those industries where impacts seemed most likely to occur.

1. Interview Program

A total of 85 interviews with Bay Area business and industry leaders were held to confirm or refute the relationship between BART's service and the observed shifts in the structure of the Bay Area economy. The interviewees were selected in part on the basis of the employment analysis and in part on the basis of judgment and *a priori* reasoning.

Interviewees were classified into two groups. One group consists of key informants knowledgeable about the overall performance of the Bay Area economy — particularly location decisions — because of their roles in finance, real estate, industrial park development and transportation systems. This group was interviewed to gain general insight into possible impacts. The second group consists of experts in specific economic sectors.

The component of the interviewing program focused on BART's potential impact on the competitive advantage or operational efficiencies of central administrative and professional offices, the government sector, services, finance and manufacturing. Key informant interviews also sought to identify potential BART impacts on other industrial sectors which might not have emerged from the employment analysis.

The interview program was designed to gather information or evidence that would lead to the acceptance or rejection of a number of preconstructed hypotheses regarding BART or its impact on commerce and employment in the Bay Area, in order to determine impacts which would not result from the NBA. In addition it served to develop a data base from which relevant case study targets could be selected for further analysis.

Evidence which would allow acceptance of any of the following four positive hypotheses would verify a BART impact.

- BART service constitutes a significant, although subjective consideration in the regional location decisions of public sector agencies, and commercial and industrial firms, such that the competitive position of the Bay Area is enhanced.
- BART is a significant factor contributing to the ability of the Bay Area to attract highly skilled technical and management personnel.
- BART service contributed to the production of a net increase in operating efficiency in the sectors interviewed.[1]
- BART service contributed to increasing sales and income in the region and thus the growth of the Bay Area economy.

The interviewing program results overwhelmingly supported three conclusions:

- There was no locational advantage for the BART service area compared to other areas in the Bay region, or other regions, because of the existence of BART. There were no instances where BART service could be cited as a significant or causal reason for a locational decision from outside the Bay Area.
- There were no instances cited where BART provided a significant efficiency of operation for an existing business. BART usage is a convenience in many instances, but no case was identified in which the availability of BART service would have a measurable effect on productivity or operating profits.
- There was no indication that BART in any way affected demand for the products of the Bay Area's export-base industries -- including the tourism industry.

---

[1] The term "increase in operating efficiency" is used to denote a situation where an individual production unit (e.g., government office, factory) produces the same output using a reduced input of any factor (or additional output using the same inputs).

These findings emerged from an extensive structured interview program. The program was formulated to narrow the investigation, successively, from broad potential impacts to very specific industry or firm examples.

The directed interviews -- 60 interviews with representatives of sectors in which impacts might have occurred -- provided little further support for the existence of any BART impact on the research hypotheses.

Land developers considered BART inconsequential to interregional location decisions, although it provided an enhancement of the region's image.[1] This observation was reinforced by interviews with executive search firms.

Health services officials believed BART may have improved efficiency by facilitating interoffice travel. Representatives of the legal profession minimized that impact and expressed reluctance to depend on BART's reliability. Banking institutions considered it to be faster, possibly, in processing interbank communication. Manufacturing concerns noted little effect on their interregional location decisions, the availability of the work force, or the competitive advantage of the region.

BART has not been viewed as a significant factor in attracting either tourism or convention business.

2. Case Study Findings on Transportation Service Impacts

Despite the research results which, to this point, reflected no significant BART impact on Bay Area employment and commerce, four case studies – representing the manufacturing, health care, finance and public services sectors – were selected on the basis of the employment analysis and the interviews. These case studies attempted an in-depth identification of BART impacts that might have been overlooked in an analysis of gross employment data or more general interviews. Since no interregional location shifts were identified which cited BART as a cause, the case studies pursued the effects BART service might have on business efficiency and operations for activities which may have been influenced in their intraregional location decisions. The purpose of this shift in focus was to identify any BART impacts on business and commerce which might justify BART's having a greater influence on interregional locational decisions in the future.

The first case study involved the headquarters operations of the Clorox Company, a long-time Bay Area manufacturer of household products, which had recently relocated its headquarters office function from elsewhere in Oakland to Oakland City Center — a location with excellent access to the BART system. Selection of this case study most decidedly did not involve any "randomization". To the contrary, the conjecture was that if there are efficiencies of operation for headquarters functions anywhere in the Bay Area that can be attributed to BART, they would exist in this case.

---

[1] As noted previously, intraregional locational decisions were not the subject of the research project, but are being studied in the Land Use and Urban Development Project.

The conclusion was that access to BART was not key to the location decision of the company, although it built in a redevelopment project which might have been smaller in size or later in time without BART. Use of BART for business purposes is regarded merely as a convenience, not as essential.

One impact of BART on this particular headquarters operation must be considered. It is clear from the interviews with Clorox Company representatives and from review of the firm's overall public relations program that BART is used to enhance the "image" of the organization, even though there is no evidence that the BART service was instrumental in the location decision. For example, BART's trains and the convenient access to BART service at the Oakland City Center project were prominently displayed in the firm's 1976 Annual Report; some component of a high-speed bus system would probably not have been cast in this subjective, but interesting, role.

The second case study considered the Kaiser Foundation medical services as an economic sector. This analysis complemented the consideration given to Kaiser when the impact of BART on institutions was considered (4), and dealt with medical service delivery as an economic activity with demand, supply and production functions not markedly dissimilar to any other enterprise. The Kaiser case study, much as the headquarters office case study, was deliberately selected because of *a priori* indications that a BART impact might be identified.

The conclusion from the analysis of Kaiser Foundation medical services was that, once again, BART is a convenience and is, in fact, used in the course of Kaiser's business operations. A limited number of Kaiser's patients utilize BART to take advantage of Kaiser services but, in fact, there is every indication that the same group would use the No-BART Alternative. There is some interest in the ability of BART to enhance future interchange between the Kaiser headquarters in Oakland and the major facility in Sacramento, particularly when AMTRAK service[1] will provide a direct connection between Sacramento and Kaiser headquarters near MacArthur Station in Oakland. There is no indication that BART has had an impact on economic efficiency.

The branch banking operation of California Savings & Loan Company was selected as the third case study. This moderately-sized Bay Area savings and loan institution has four of its five branches located in or near a BART station. This case study offered an opportunity to evaluate BART's utility as a facilitator of technological innovation that would not have been possible with the No-BART Alternative as well as improving efficiency.

---

[1] AMTRAK provides a direct connection at Richmond BART station.

The technological innovation made possible by BART was a remote teller within the Powell Street BART Station, which permitted BART patrons to carry out banking transactions from the station. Market potential for the remote teller facility had been carefully researched by the company, using experience from transit stations in New York and Philadelphia, but the results have been disappointing. One of the most frequent transactions is a request for change from a twenty-dollar bill, since BART's automatic change equipment will accept only denominations of five dollars and less.

In what is a familiar pattern, instances of BART usage for interbank transfers were noted, but they were by no means significant to a location decision, nor could their effects be interpreted as having an effect on the efficiency of bank operations.

The fourth and final case study involved the impact of BART on a true Bay Area growth sector, government and public services. A total of three separate public agencies were used in the analysis, the U. S. Energy Research and Development Administration (ERDA), the U. S. Social Security Administration (SSA) and a field office of the Federal Bureau of Investigation (FBI).

ERDA's regional headquarters is located in San Francisco and an administrative center is located in Oakland's City Center project. It was clear from the interviews and case study analysis that ERDA's decision to locate in Oakland had been influenced by BART. In practice, the impact on efficiency or improved ability to recruit employees was inconsequential. BART is used by senior agency officials who are attending meetings in the San Francisco regional headquarters, but this is a convenience, rather than a significant operating efficiency. Similarly, the location near BART was not found to facilitate the journey to work enough to increase operating efficiency.

The Social Security Administration was a particularly interesting case study in that, for a time, BART provided direct Daly City-Richmond service twice a day. This service was known as the "Social Security Special" and was designed to provide direct access to the Social Security Center by its existing employees -- particularly transit-dependent employees -- when the Center moved from San Francisco to Richmond. In fact, the case study indicated that BART's reliability problems discouraged its use. There was even some suggestion that BART service became a convenient explanation for tardiness. In any case, quantitative indications point to a decline in productivity after the move to Richmond, and in no case could there be found an advantage that could be attributed to BART.

The final example – the FBI field office in Berkeley – runs counter to the conclusions from all the other case studies. Two of the six agents are regular BART commuters and the local FBI office has been able to dispense with one staff car out of a total of six because the agents could use BART in carrying out their daily responsibilities. This represented the only identified efficiency of BART transportation service in the case studies.

VII. CONCLUSIONS AND IMPLICATIONS

The purpose of this study has been to evaluate the economic and financial impacts of building BART in the San Francisco Bay Area. The research conclusions serve several ends. In an historical context, the findings measure some of the impacts which BART's construction and operation have had on the San Francisco Bay Area. To the extent that BART's technological characteristics can be generalized to represent a generic rapid transit mode, the findings also permit a comparison of the potential economic impacts of a regional rapid transit system with incremental improvements in bus transit service. The potential application of these findings elsewhere, at the time a region chooses between alternative regional transportation systems, probably is the most important purpose. The findings of the study, therefore, are considered here in the context of current transportation investment policies for urban mass transit and complementary urban development policies.

A. Rapid Transit in the Bay Area has had Little Measurable Impact on Regional Economic Development

Regional economic development aims to improve the economy of a region by more fully utilizing the region's resources and capturing an increasing share of national growth. There is no evidence that BART contributed to either of these objectives in the fifteen years since voters confirmed that decision to build BART.

Although five industry groups within the San Francisco Bay Area — government, central offices, services, finance and manufacturing — have grown faster than can be explained by national or industry trends since 1962, extensive interviewing within these industries failed to disclose BART as responsible for this growth. The research did not reveal BART as a determinant in industries' decisions to expand locally (or to remain, instead of relocating outside the region).

Frequently, transit investment in an urban center is justified on the basis of transit's ability to improve efficient use of the region's human and physical resources, which, in turn, will make the region a more efficient location for industry and commerce. In order to increase that share of the nation's future growth which locates in any region, transit would have to improve accessibility to industrial locations sufficiently to enlarge the size of the available work force through expanding the commuting radius; or, transit would have to increase the efficiency of doing business by improving networks of communications essential to business activity; or, possibly, do no more than improve the image or quality-of-life as a subjective consideration in corporate location decisions. This project aimed at evaluating each of these hypotheses.

Preliminary accessibility comparisons between the alternatives might appear to show improvement. BART has improved the average potential access time for the total population to the region's employment centers by up to 19 percent (which, however, is only eight minutes). Improved accessibility is greater for higher-income white households; but, this reflects BART's original transportation objectives, which sought to relieve congestion on suburban-to-downtown transportation corridors — commute routes serving primarily higher-income white households.

Through BART, unemployed appear also to gain potential decreased travel time to employment centers. This does not necessarily imply greater employment opportunity for the unemployed, however, since the average access time for this group is reduced by a mere five minutes. Nonetheless, BART may have increased Bay Area employment accessibility (or modified residential patterns) by making feasible the commute between the distant East Bay communities and employment centers in San Francisco and Oakland.

This region also could appear more attractive to industry if rapid transit service improved business efficiency within the region. For efficiencies to occur, rapid transit would need to function in interpersonal or interoffice communication — to facilitate messages or deliveries, or to facilitate meetings between businessmen. Surveys indicate little use of BART is for business purposes. Further, extensive interviewing failed to confirm that business use of BART has increased business efficiency. In some examples, in fact, results show that the unreliability of BART service has caused an actual reduction in efficiency.

The image of a region, its attractiveness or reputation as a dynamic growth center, also may influence corporate location decisions. Generally speaking, the image of the San Francisco Bay Area already is very positive; there is no evidence that a high-technology rapid transit system contributed significantly to the perceived advantages of the Bay Area for corporate location decisions. On the other hand, BART may have reinforced expectations of a high level of transit service within the region.

This research in no way proved that the three BART counties experienced economic development or growth with BART that they would not have otherwise experienced. The location of that growth within the three counties may have shifted because of BART — locating closer to the fixed guideway system — but there is no evidence, during the first decade-and-a-half following the decision to build, that net growth increased due to rapid transit.

B. Capital Expenditures for a Rapid Transit System Will Have a Positive Short-Term Impact on the Regional Economy

Constructing and equipping BART, as for any public works project, will call for the purchase of goods and services in the region.

For a rapid transit system, this frequently will mean spending funds unavailable in the absence of rapid transit construction. Thus, a net increase in the economic activity of the region is seen.

Of the $1.5 billion capital cost of BART, $1.2 billion was spent within the nine-county Bay Area. By the time the economy had provided all the goods and services purchased over the 12-year construction period, the secondary impacts of these expenditures had caused the total increase in sales and income in the Bay Area to swell to $3.1 billion.

BART's expenditures alone resulted directly in the employment equivalent of nearly 31,000 person-years of labor. Total Bay Area employment increased more than 75,000 person-years, including both direct employment and secondary impacts.

Household income within the region increased nearly $927 million from all the direct and indirect economic activities stimulated by BART's expenditures.

While these impacts are large, they do not provide the basis for long-term regional economic prosperity. The investment impacts did not change the total sales and income in the nine-county Bay Area, the total regional employment, nor personal income in the region in any year by more than one half of one percent. In a less-diversified economy with underutilized economic resources, and in a smaller region, the effect on the economy might have been far more significant.

Although there had been concern, there is no evidence that increasing construction in a region with a project of this magnitude might have an inflationary impact. The construction wage rate increased 40 percent during the years of BART's construction, but this could be explained by national, regional and industry trends. BART's on-site construction work force never exceeded 5 percent of the total heavy construction work force in San Francisco and Oakland during a period of less than full employment in the industry.

C. Operation of Rapid Transit in the Bay Area Stimulates the Economy More than Bus Transit, Because BART Costs More to Operate

The No-BART Alternative (NBA) represents the transportation system which the BART Impact Program has hypothesized would have occurred in the absence of BART, based on the regional forces governing population, land use, transportation, politics and public financing. The No-BART Alternative is defined as a level of service among bus transit operators of the region sufficient to carry the transit demand in the absence of BART, although not the current BART patronage (since BART has induced a considerable amount of transit travel).

The cost of providing this alternative service has been estimated to total $13 million more than existing agencies currently incur, but BART's operating costs totaled nearly $60 million in 1976. Thus, providing transit service with rapid transit introduces nearly $47 million into the economy which would not otherwise be spent (on transit, at least).

This spending stimulates a total of nearly $159 million in additional sales and income in the region, after all secondary economic activity is included. In addition to the 1,265 additional employees needed for BART to provide service than would be needed for the bus alternative, 1,752 more job equivalents are created from secondary purchases of goods and services. Total household income increases $52 million per year from increased operating expenditures with BART; nearly 22 percent of that household income is received by minority households.

The important issue related to these statistics is that this economic impact from BART operations simply is a function of spending more money. Similar impacts could occur in the economy from spending $47 million on any public program. Using transit expenditures to stimulate sales, income and employment must be evaluated in terms of the non-economic benefits, specifically whether improved accessibility warrants this size of annual expenditure.

D. BART's Expenditures on Construction Resulted in Short-Term, if not Long-Term, Increases in Employment Opportunity for Minorities in the Construction Trades

One of BART's economic opportunities was to use the expenditures on construction as leverage in improving the employment potential for minorities within the region. During its construction, BART's direct expenditures alone accounted for almost 31,000 person-years of work. On-site construction employment during the peak construction year involved almost 3,000 employees. By establishing equal employment standards, BART increased the percentage of minorities in the labor force to 36 percent, significantly higher than the 22 percent participation of minority workers in the regional construction work force. Despite this positive impact, in a period of strong affirmative action and with the support of apprenticeship programs, this impact might have had a greater effect on post-construction employment opportunities for minorities.

Unfortunately, the largest share of minority employment occurred within the laborer category. Thus, while BART construction may have involved employment for minorities, their employment skills were not necessarily enhanced after construction was completed. The residual impact of BART's construction employment, then, may have only been exposure for workers to contractors and unions, without necessarily improving the opportunity for advancement in the future.

E. A New Transit Agency is Capable of Improving the Employment Opportunities for Women and Minorities

BART has a larger percentage of women employees and they are better compensated than the bus transit agencies within the region. Further, there are more women in nonclerical functions, including management, at BART than the other agencies. A total of 18.8% of BART's work force is female, while bus transit agencies in the BART counties employ only 8.8 percent females. Almost three-quarters of the female employees at the bus transit agencies within the area earn less than $13,000 per year. By comparison, only 18.5 percent of BART's female employees earn less than $13,000 per year and over 40 percent earn more than $16,000 per year. This impact could reflect the staffing of a new agency during a period when equal opportunity for women has been a highly visible issue.

Minorities' opportunity for responsibility appears less impressive. While nearly 40 percent of the BART work force is minority, twice the representation of minorities in the regional population as a whole, the number and relative proportion of minorities in the bus agencies'work forces are higher. This characteristic of BART employment may be the result of staffing a new high-technology system during a period when recruiting of minority technicians was limited. Bus transit agencies, on the other hand, provide for internal advancement in an agency traditionally open to minorities.

F. Households Will Pay the Majority of BART's Local Construction Costs, with a Heavier Relative Burden on Lower-Income Households

The total cost of BART's basic system, over the life of the general obligation bonds, will total $1.7 billion, including the retirement of the general obligation bonds and the sales tax bonds, as well as payment of interest. Sixty-five percent of this cost will be paid by households, either as consumers of housing, whether as owners or renters, or consumers of taxable retail sales. This also includes the cost which will be borne by households in the form of increased prices as business shifts its tax burden to the consumer.

The portion of the tax burden borne by business which cannot be shifted to the consumer will total 24 percent of the total local cost; nearly 11 percent of the financing cost will be paid by nonresidents of the region, either through purchases by tourists or businesses from outside the region, or through property tax exemptions which are, essentially, refunded from the State General Fund.

The financing plan used to pay the local share of BART's costs will impose a greater burden on households in the district with lower income than on those with higher income, although this regressivity is common to many public works projects. In 1976, the annual cost of retiring the capital debt imposed a burden equivalent to 0.72 percent of the income of a retired individual earning less than $4,500 per year. An affluent family of four, earning over $45,000 per year, would pay a third of that burden, only 0.24 percent of its income. These households bear this burden regardless of whether they use BART.

While households will have paid nearly 65 percent of the local cost of financing BART, local financing supported 75 percent of the total system cost. Thus, households actually paid less than half of the total cost of the system (as opposed to the local share).

G. The Magnitude of BART's Bond Issue Had No Impact on the Cost of Other Local Borrowing

BART debt, just as any major local bond issue, could affect other local general obligation debt costs in two ways. First, because it represents an increase in the local tax burden, it could increase the bond buyers' concern about tax delinquencies and thus increase general obligation debt costs for other projects. Secondly, BART debt could have represented an infrastructure investment interpreted by the financial community as increasing the local ability to support general obligation debt. The second effect would increase the security of debt and offset, to some extent, the increased cost.

Both statistical analysis and interviews with key individuals in the municipal bond financing industry indicate that BART's bond issue, although it increased the bonded indebtedness of the region from 10 percent of the three-county district's assessed value to 25 percent in a single election, was not responsible for increasing public debt costs to other borrowers. On the other hand, there was no conclusive evidence to indicate that local agencies or jurisdictions sought to finance capital improvements with nonvoted bond issues, or to deter projects altogether, for fear of voter rejection in the shadow of BART's impact on regional bonded indebtedness.

H. Households Will Pay the Majority of the Operating Deficit with Lower-Income Households Bearing a Heavier Relative Burden

The increased cost of operating BART, rather than bus transit, is paid by the property tax and the sales tax, in addition to fare revenue. The characteristics of the tax burden for these operating expenses is similar to those of the capital expenses, and because of the taxes used, will tend to be regressive. Households pay 69 percent of the operating deficit, businesses pay nearly 21 percent, and approximately 10 percent is paid by businesses or residents outside the region. Lower-income households will bear a greater burden (as a percent of income) than higher-income households, not unlike many other public programs. This share of BART's operating deficit is paid by all taxpayers in the region, regardless of whether they ride BART.

Yet the taxpayers who do not ride BART will remain the majority of the residents of the region. According to a May, 1975 telephone survey conducted within the greater BART service area (defined as the three BART counties and northern San Mateo county), 11.2% of all weekday vehicle trips in total could have been made or were made on BART. Of this travel market, BART captured only one-fifth or (21.3%) of its maximum weekday travel market in May, 1975 (14).

I. Locally Financed Costs of Providing Bus Service with BART are More Than They Would Be Without BART

Without BART, fewer transit trips would be made annually, but a portion of BART's patronage would be carried by bus transit agencies within the region. It has been assumed by the Metropolitan Transportation Commission that this patronage can be carried without substantially increasing the size of the bus operations that currently support BART. The largest portion of the patronage which would shift to bus transit would be riding on the long haul and relatively more profitable transbay routes. As a result, AC Transit, the local transbay bus system, would experience a reduction in its operating deficit. Since AC Transit's operating deficit is supported primarily by the property tax within its district, that property tax could be reduced, reflecting the reduction of the operating deficit by almost $900,000 per year in increased fare box revenue.

BART also receives California Transportation Development Act funds, which are redistributed to the regions. If BART were not an operating agency, $2.9 million of its TDA funds would be allocated to AC Transit. Thus, the property tax bill for AC Transit District taxpayers would be reduced an additional $2.9 million. This total reduction of $3.8 million represents over 20 percent of the AC Transit property tax support. The taxpayers of Alameda and Contra Costa Counties who are within both transit districts pay more for both BART and bus service because of BART.

J. The Implications of the Economic Development Impacts for Federal Transportation and Urban Development Policies

Whether or not the specific findings of the Economics and Finance Project are transferable as a measure of the potential impacts elsewhere, there are certain relevant policy implications which emerge from the findings.

The use of these findings in deciding among alternative future transit systems for other urban areas must consider the unusual characteristics of BART. The alternative to rapid transit in the Bay Area against which BART was compared for the BART Impact Program was a well-established bus transit system that offered a high level of service. This may have resulted in less dramatic impacts than would occur elsewhere.

The Composite Report, which described the benefits of BART to the voters who would approve BART's financing in 1962, expressed an expectation that prevails in transportation planning, even today: "The rapid transit system would improve the area's living and working conditions, economic efficiency and availability of workers, and attract a larger share of the nation's future growth."

In earlier stages of urbanization, perhaps in a young and growing city, rapid transit might stimulate regional economic activity. Even then, transit's contribution may be the shaping of cities, which, through the advantages of density and the proximity of services, make a region a more attractive location for business. But these early stages of urbanization are past in most metropolitan areas.

There is no evidence from the present research that any industry moved to the Bay Area because BART or BART's service influenced the corporate decisionmaking process. There is no evidence of even the perception that BART improved the economic viability of the region, or the efficiency with which the region's resources could be utilized.

These findings suggest that the level of transportation service which is considered essential to economic viability in location decisions had been reached with the combined resources for interurban travel provided by existing highways and transit networks. The marginal impact of improved rapid transit service on movement within the region, as exemplified by BART at this time, is not sufficient to stimulate economic development. Rapid transit, if introduced to a region, may have impacts on the locational decisions of business, commerce or industry _within_ the region. But these impacts represent spatial or land use impacts and do not bear on the competitive advantage of the region itself in gaining a larger share of the nation's future growth. Instead, the development which occurs in the vicinity of transit stations, so frequently cited as visible evidence of transit's impact on regional economic development, may represent only shifting piles of sand within a region.

K. The Implications of the Expenditure Impacts for Federal Transportation and Urban Development Policies

If one intent of urban policy is to assure that unemployment is alleviated within the cities, rapid transit projects should be carefully designed to achieve these objectives. The input-output analysis used in the Economics and Finance Project provides a means for developing transit system designs which meet transportation objectives and also increase employment effects on the inner-city unemployed.

The unemployment characteristics of a city can be evaluated by industry and occupation, as well as by racial characteristics. The input-output analysis can be used to test different types of systems and alternative construction methods or system benefits, to identify the employment impacts of each alternative on the industries and occupations critical to the economic viability of the specific city in which the transit system is proposed. Strong advocacy of spending more money sooner will result in jobs, but they may be jobs in occupations in which there is no unemployment within the city, in which case labor might be imported to a city which already has a high unemployment rate. Thus, the methodology developed in the BART Impact Program provides an opportunity to target very specifically the impacts a transit investment can have on meeting urban policy objectives. It would require, however, a conscious acceptance of the importance of meeting urban economic development objectives as well as transportation objectives as part of the transportation planning process.

There are other implications from the methodology. Urban policy seeks to reinforce or develop the economies of older cities. If it is accepted that transit investment is a fundamental means of achieving this urban policy, the transit investment should be structured to strengthen the competitive position of both workers and industry in the region following construction of the transit system. Improving local training and industrial capacity during the course of building a transit system could parlay short-term expenditure effects into long-term effects on the economic viability of the city.

Achieving these reinforcements to local competitive advantage would require that the major share of the work is contracted to local firms. One means of accomplishing this improvement to the urban economic capacity would be to provide local firms an advantage in bidding for construction or procurement contracts, recognizing, quite explicitly, that this represents a direct subsidy to training and equipping a city's industry and work force to achieve increased economic viability in the future.

L. The Implications of Employment Impacts for Federal Equal Opportunity and Affirmative Action Programs

The findings of the BART Impact Program indicate that the major share of the minorities hired during BART's construction worked in the laborer category, which has little potential for skill enhancement. While this may not prove true in transit systems which have been constructed since BART was completed, it does emphasize the importance of apprenticeship programs for minority youth in order to improve their competitive advantage or employment opportunity after construction of the transit system.

M. Transferability of the Techniques of the Economics and Finance Project

There is a final implication of the Economics and Finance Project for federal policymakers. Specific conclusions about BART economic and fiscal impacts are strongly conditioned by BART's unique circumstances, but the techniques of analysis and the research questions that were asked and answered are quite transferable. They may be useful to those who are preparing before-the-fact estimates of the economic and fiscal impact of planned transit systems. The present research, done after the fact, did not confirm certain of the estimates or claims that were made before BART was constructed, and with the benefit of hindsight, it would appear that revised methods of analysis could have more accurately measured the probability of certain claimed economic impacts actually coming to pass.

The following paragraphs summarize the techniques of analysis and the research questions that might be included in an analysis of transit alternatives that would preceed the commitment to one or another new transit system.

1. Comparison Between Alternatives

The retrospective analysis of BART's economic and fiscal impacts confirmed the practicality of an impact assessment framework that recognized impacts as being the difference in outcome between one action (constructing and operating BART) and another plausible action (continuing to operate the NBA). The emphasis on comparison of alternatives that was a major technical feature of the Economics and Finance Project is as applicable to a prospective alternatives analysis as it is to a retrospective research project.

2. Estimating Impacts of Construction and Operation

The estimates of BART's construction impact on the economy and the impact of operating BART compared to operating the NBA use input-output models for two separate periods. This methodology is equally applicable to a before-the-fact alternatives analysis, although it would not normally be possible to estimate changes in the inter-industry economy of a region over the time that a transit system was being constructed, and to use different models for different time periods. With that minor exception, the methodology is entirely transferable and recent techniques of construction of input-output models (some of which are described in (3)) make the use of input-output analysis entirely feasible, even with a fairly modestly budgeted alternatives analysis.

There are extensions to the technique of input-output analysis that might be relevant to an alternatives analysis:

- The estimates of direct plus indirect employment effects could be converted into estimates of job opportunities by skill (and, accordingly, by wage levels) if a matrix of occupations by industry were available for a region or were estimated especially for the alternatives analysis.[1] An analysis of occupational requirements induced by a transit system could be used, among other uses, to compare employment opportunities with the extent of unemployment in different occupational sectors.

---

[1] The same techniques that were used to estimate the dollar flow tables in the present project could be used to modify national or state industry-occupation data to approximate the unique circumstances of a particular region .

- More detailed and sophisticated analysis could be done for individual economic sectors if one or another sector was considered to undergo a particularly significant impact. The results of this exogenous analysis could be treated as an input to the input-output model. As an example, if major transit facilities or equipment were to be manufactured within a region and this manufacturing sector was so significant as to change demand for other of the region's products in a non-linear way, then an econometric model could be used to test these effects. The lesser, more straightforward, impacts on other sectors could then be tested using the input-output model with its more restrictive assumptions about linearity.

The use of an input-output model that contains two or more household sectors is quite applicable to an alternatives analysis. The present study classified the households as minorities and non-minorities but, in another region, an equally useful classification might differentiate households by income level and include separate rows and columns for households of different incomes. The impact of the transit project on these different households could be tested directly.

3. Estimating Impacts on Business Efficiency and Economic Growth

The research techniques used to measure BART's impact on the growth and operation of the Bay Area economy depended on before and after evaluations of data, and on an extensive program of interviews to determine what actually had occurred. Neither technique is particularly applicable to a before-the-fact alternatives analysis.

Nonetheless, it is in the area of impacts on economic efficiency and economic development where the methodology of the Economics and Finance Project may be most transferable to alternatives analyses to be done in other regions.

One of the most significant findings of the Economics and Finance Project was that, in spite of the estimates and assertions before BART was constructed, the research did not confirm that significant economic efficiencies had been obtained. The fact that claims of economic efficiency were not confirmed suggests that such claims made in the future be subjected to a particularly careful analysis. The analysis should identify in specific terms both the economic efficiencies or locational advantages that would result from one or another transit system, and the magnitude of such effects. If an impact on economic efficiency is claimed, the economic sectors that would enjoy improved efficiency should be identified and the specific level of improvement in operations, cost of doing business, profitability, etc., should be estimated so that at least a judgmental assessment could be made of whether any claimed efficiencies would be material enough to effect the circumstances either of a single industry or of an entire region.

4. Estimating Impacts on Employment Opportunity

The Economics and Finance Project produced methods to estimate, in advance, the impact of a transit project on employment. The project also confirmed the need for a carefully designed on-going monitoring to measure impacts of employment during the course of transit system construction and operation.

The techniques for measuring the impacts on construction employment involve the use of the input-output model and were discussed immediately above. The assessment of the impact of BART's operation on employment opportunity, which depended on after-the-fact data, is only partially transferable to an alternatives analysis. Nonetheless, the research confirms that it would be possible to estimate relative staffing requirements by experience level and occupational class when preparing proposed transit alternatives and then, as a matter of policy, to develop targets for higher paying or higher skilled jobs for groups that have historically been underrepresented in such jobs.

A monitoring program would be needed to assure that targets are being met and to permit a "mid-course correction" if they are not being met. A management and monitoring program must be designed with considerable care and with some attention to the possibility of erroneous data about progress towards employment goals being collected. A theme that recurred in more than one of the interviews on employment opportunity during the present project was that minority employees were relocated from one job site to another in a pattern that correlated suspiciously closely with the pattern of verification of on-site employment by ethnicity.

A monitoring program could easily be installed at the outset of a transit project so that all concerned would be understanding the ground rules and circumstances under which the project would be evaluated.

A final lesson on methodology from the Economics and Finance Project concerns any claim that improved accessibility between employment centers and residential centers[1] would improve employment opportunity in a region. The results of the Economics and Finance Project suggest that any claims of impacts on employment opportunity should be substantiated in detail, considering not only improved accessibility, but whether:

---

[1] It should be recalled that an original hypothesis — although it was not confirmed — was that BART may have had an impact on executive recruiting because of improved accessibility between affluent suburbs and central business district employment. The consideration of accessibility impacts need not be limited to the poverty neighborhoods or neighborhoods of high unemployment.

- actual employment opportunities would exist in employment centers for those who would enjoy improved accessibility;
- skill levels in centers of unemployment were appropriate to the types of jobs that would be available;
- the improvements in accessibility were material enough to suggest, in an individual instance, that an unemployed individual might, in fact, be able to obtain employment.

5. Estimating Fiscal Burden

The techniques that were used to estimate BART's fiscal burden are well known and generally applicable to a before-the-fact alternatives analysis. Three aspects of the methodology that are relative to an alternatives analysis and that were not included, for example, in the analysis that preceeded BART's construction are:

- a specific comparison of the burden of a proposed transportation with the burden that would be caused by the decision to invest in an alternative system;
- a quantitative estimate of the portion of the burden that would be borne by households, by business in the region, and by business outside the region[1];
- separate analysis of the burden on different household types to illustrate the extent to which one or another typical household group pays more or less for a proposed system – measured either in total dollar terms, or as a percent of household income.[2]

6. Estimating the Impact on Local Government Financing Decisions

The analysis of BART's impact on the cost of borrowing and on financing decisions for projects other than BART depended critically on access to after-the-fact data that would not exist for an alternatives analysis. Further, as noted previously in the present report, the technical conclusions themselves – that BART had not had an adverse impact on bond interest rates or a dampening effect on the decision to undertake other capital investments – may not be transferable because the perceptions and the facts about local government finance have changed markedly in the last few years.

---

[1] In the context of an alternatives analysis, this could lead to a comparison of burden and benefits, although such an analysis was not in the scope of the Economics and Finance Project.

[2] This analysis could be used as a design tool to help select a composite financing plan with acceptable characteristics of progressivity, predictability, horizontal neutrality, etc.

REFERENCES

*1. Bartle Wells Associates. "The Impact of BART's Bond Issue on Regional Public Financing". Prepared for the Metropolitan Transportation Commission. August 1977.

*2. Booz, Allen and Hamilton, Inc. "The Impacts of BART on Local Government Expenditures, Revenues and Financial Policies". Prepared for the Metropolitan Transportation Commission. December 1977.

3. Goldman, George, Darryl McLeod, John Mamer, Jr., and Joyce McReynolds. "San Francisco Bay Area Input-Output Model 1967, 1974". Cooperative Extension Service, University of California, Berkeley, California. Forthcoming.

*4. Jefferson Associates, Inc. "Impacts of BART on Bay Area Health Care Institutions". Prepared for the Metropolitan Transportation Commission. March 1977.

*5. McDonald & Grefe, Inc. "The Distribution of the Tax Burden of Financing BART's Construction and Operation". Prepared for the Metropolitan Transportation Commission. October 1977.

*6. ____________________. "The Economics and Financial Impacts of BART, Final Report". Prepared for the Metropolitan Transportation Commission. January 1978.

*7. ____________________. "The Economic Impacts of BART Capital and Operating Expenditures". Prepared for the Metropolitan Transportation Commission. October 1977.

*8. ____________________. "Impact of BART on the Competitive Advantage and Efficiency of Bay Area Business Operations". Prepared for the Metropolitan Transportation Commission. August 1977.

*9. ____________________. "Theoretical Framework for the Evaluation of Economic and Fiscal Impacts of BART". Prepared for the Metropolitan Transportation Commission. July 1976.

*10. McDonald & Smart, Inc. "Bay Area Rapid Transit: Formulation of a Generalized No-BART Alternative". Prepared for the Metropolitan Transportation Commission. May 1975.

11. Metropolitan Transportation Commission. "1976 BART Passenger Profile Survey: Field Methods and Processing Procedures". September 1976.

12. ______________________________________. "The No-BART Alternative Financing Plan". February 1977.

---

*Documents available through National Technical Information Service (NTIS).

*13. Peat, Marwick, Mitchell & Co. "Analysis of BART Accessibility Impacts". Prepared for the Metropolitan Transportation Commission. December 1976.

*14. ____________________________. "Travel in the BART Service Area". Prepared for the Metropolitan Transportation Commission. September 1977.

STAFF FOR THE CONSULTANTS

McDonald & Grefe, Inc.

Angus McDonald	Technical Director
Richard Grefe	Project Manager

Deborah Brecher
Edwin Chase
William Dillinger
William Kent
Darryl McLeod
William Noack
Anita Reetz
Dean Westerfield

Emilita Anderson
Barbara Brenner
Una Glass
Deborah Hill
Preston Thayer

Consultants:
George Break, Public Finance
George Goldman, Statistics

Bartle Wells Associates

Raymond K. O'Neil	Vice President

Charles A. Long

Dukes, Dukes & Associates, Inc.

John Dukes	Principal in Charge

Phyllis Freeman
Theresa Hughes

University of California Cooperative Extension, Berkeley

George Goldman	Principal Investigator

Darryl McLeod
John Mamer, Jr.
Joyce McReynolds

☆ U. S. GOVERNMENT PRINTING OFFICE : 1980 311-586/173